# 1NC v Stockdale AS

## 1NC – T

#### Interpretation: “Appropriation of outer space” by private entities refers to the exercise of exclusive control of space.

TIMOTHY JUSTIN TRAPP, JD Candidate @ UIUC Law, ’13, TAKING UP SPACE BY ANY OTHER MEANS: COMING TO TERMS WITH THE NONAPPROPRIATION ARTICLE OF THE OUTER SPACE TREATY UNIVERSITY OF ILLINOIS LAW REVIEW [Vol. 2013 No. 4]

The issues presented in relation to the nonappropriation article of the Outer Space Treaty should be clear.214 The ITU has, quite blatantly, created something akin to “property interests in outer space.”215 It allows nations to exclude others from their orbital slots, even when the nation is not currently using that slot.216 This is directly in line with at least one definition of outer-space appropriation.217 [\*\*Start Footnote 217\*\*Id. at 236 (“Appropriation of outer space, therefore, is ‘the exercise of exclusive control or exclusive use’ with a sense of permanence, which limits other nations’ access to it.”) (quoting Milton L. Smith, The Role of the ITU in the Development of Space Law, 17 ANNALS AIR & SPACE L. 157, 165 (1992)). \*\*End Footnote 217\*\*]The ITU even allows nations with unused slots to devise them to other entities, creating a market for the property rights set up by this regulation.218 In some aspects, this seems to effect exactly what those signatory nations of the Bogotá Declaration were trying to accomplish, albeit through different means.219

#### Violation: constellations’ use of LEO does not exclusively occupy or preclude other orbits

Johnson 20 [(Christopher, Professor of Law at the Georgetown University Law Center, Adjunct Faculty at the International Space University in Strasbourg, France, the Legal Advisor for the Moon Village Association, Core Expert and Rule Drafter in the Manual on International Law Applicable to Military Activities in Outer Space project, Juris Doctor from New York Law School and an Advanced Masters in Law in Air and Space Law from Leiden University’s International Institute of Air and Space Law) “The Legal Status of MegaLEO Constellations and Concerns About Appropriation of Large Swaths of Earth Orbit,” Handbook of Small Satellites, 2020] JL

The use of LEO by satellite constellations is substantially similar to the use of GSO, and therefore permissible. In each region, individual actors are given permission - either from a national administrator or from an international governing body (the ITU) via a national administer–to use precoordinated subsections of space. In a way that is overwhelmingly similar to the use of orbital slots in GSO, the placement of spacecraft into orbits in LEO or higher orbits does not constitute possession, ownership, or occupation of those orbits. This is because States (and their companies) have been occupying orbital slots in GSO for decades, and these uses of GSO have never been accused of “appropriating” GSO. The users have never claimed to be appropriating GSO, and their exercising of rights to use GSO is respected by other actors in the space domain. This is the same situation for other orbits, including LEO and other non-Geostationary orbits. And while GSO locations are relatively stable (subject to space weather and other perturbations, and require stationkeeping), spacecraft in LEO are actually moving through space and are not stationary, so it is even more difficult to see this use by constellations as occupation, much less appropriation. Moreover, Space Situational Awareness (SSA) and Space Traffic Management (STM) will allow other uses to use these orbits, and nothing about the use of any one user necessarily precludes others. Lastly, there is no intention by operators of constellations to exclusively occupy, must less possess or appropriate, these orbits. Would not the appropriation of outer space be an intentional, volutional act? No such intention can be found in the operators of global constellations.

#### Net benefits:

#### Precision – their interp justifies jettisoning any word in the rez, like private actors and outer space which zeroes neg prep ­– proven by the absence of “appropriation” in the plan text

#### Limits – literally anything that takes place in space becomes topical under their interp – 2 physical entities can never occupy space at the same time – tourism, mining, constellations, rockets, skydiving, lunar bases, exploration, radio waves, photography – limits explosion precludes nuanced clash and privileges the aff by stretching pre-tournament neg prep too thin

#### Drop the debater – indicts the whole aff and deters abuse

#### Competing interps – reasonability invites arbitrary judge intervention and a race to the bottom

#### No RVIs – fairness and education are logical litmus tests and incentivizes baiting abuse to win on prepped out counterinterps

## 1NC – CP

#### CP: States besides the United States should ban the appropriation of outer space via Large Satellite Constellations in Lower Earth Orbit.

#### The United States should submit an environmental impact assessment of the the appropriation of outer space via Large Satellite Constellations in Lower Earth Orbit.to the UN Office of Outer Space Affairs for public comment, modification, and approval. The United States federal government should implement the approved version of the submitted proposal.

**Counterplan competes and creates the least environmentally damaging version of the aff.**

William R. **Kramer**, PhD Polisci/Futures Studies @ U of H Manoa, Currently HDR Inc. Extraterrestrial Environmental Analyst, **’14**, “Extraterrestrial environmental impact assessments A foreseeable prerequisite for wise decisions regarding outer space exploration, research and development” Space Policy 30 (2014) 215-222

To be most effective, all spacefaring nations and enterprises would voluntarily participate in assessing their extraterrestrial environmental impacts prior to undertaking actions in space. A hypothetical chronology of such a process might include: (1) Impact assessments are prepared by the action proponent and submitted to an impartial international panel or board; (2) The panel determines the assessment's sufficiency; (3) The assessment is published in an electronic or other format accessible to the public followed by a comment period; (4) The action proponent addresses comments and submits responses to the panel; (5) The panel publishes its approval or concerns; (6) The action proceeds, is **modified or is abandoned**; and (7) should the action proceed, periodic reports of the action's progress and impacts are filed for future reference in a digital format to allow broad access. The process would support the spirit of both **NEPA** to “fulfill the responsibilities of each generation as trustee of the environment for succeeding generations” (42 USC x4331(b)(1)) and Article 4(1) of the Moon Agreement's directive that “due regard shall be paid to the interests of present and future generations.” Given the likelihood that all states would appreciate the need for maintaining extraterrestrial environments and landscapes for both future research and exploitation, pressure from peer states and space industries may be sufficient to **encourage a trend of compliance**.

Such a review and approval system (perhaps similar to NEPA's relationship with the Council on Environmental Quality and its oversight function) could be attempted within the structure of the UN, such as within the **UN Office of Outer Space Affairs**. The spirit of an extraterrestrial environmental assessment program would be likely to fit within the mandate of the organization. However, amending the Outer Space Treaty or otherwise developing an administrative UN capacity to achieve the goals proposed in this paper would require a level of international commitment and cooperation that may be both lengthy and difficult to achieve. Spacefaring nations and international organizations are already invited to submit annual reports on their space activities and research to the UN Committee on the Peaceful Uses of Space, **so a precedent for reporting exists.** **Presently, however, reports tend to document positive actions and research, not details of extraterrestrial environmental impacts**.

**Extinction. EIA is key to preserve space resources, stop resource wars, and extra-terrestrial environmental damage.**

William R. **Kramer**, Hawaii Research Center for Futures Studies @ University of Hawaii, **'17**, In dreams begin responsibilities – environmental impact assessment and outer space development, ENVIRONMENTAL PRACTICE, VOL. 19, NO. 3, 128–138

**Benefits of extraterrestrial environmental impact assessment** Most publications regarding outer space resources maintain that those resources are nearly limitless, and many business models for exploitation do not imagine that resources on Mars, for example, will ever be exhausted (Lewis, 1996; Zubrin, 1996; Renstrom, 2016). Ever is a long time. While the statement may be figuratively true for some mineral ores that may last through an individual company’s project timeline, it is not necessarily true for long-term planning. **There will likely be competition for the rarest (most valuable) minerals**. Without some form of planning and regulation, they may be extracted in an inefficient and environmentally damaging manner and be **quickly depleted** (as exemplified by hydraulic mining for gold on Earth, which wasted much of the resource and resulted in extensive environmental damage) (Merchant, 1998).

How might resources be put to their highest and best use unless regulated? Both the Moon and Mars have water ice which will be **crucial for human survival**, but water also has lucrative industrial uses; it is potentially the raw material for manufacturing both rocket fuel and oxygen. **Conflicts over resource allocation** may be better addressed during an **assessment process** that seeks to balance highest and best use with discovery and first use. Who gains access to specific areas for mining becomes more problematic in that the Outer Space Treaty does not allow “ownership” of extraterrestrial territory; there is no guarantee that companies such as those listed previously will gain access to the most productive sites. The China National Space Administration is planning to place a crew on the Moon by 2024, so **competition for the best sites will be intense** (Kramer, 2015b; China Digital Times, 2012).

Space industries generally are not considering that their proposed actions may preclude alternative uses such as scientific research and human settlement. There will be a stream of not yet imagined uses that could be adversely affected or foreclosed. Many of the same conflicts between land use and human habitation experienced on Earth may emerge on extraterrestrial sites. On the Moon, for example, there are preferable sites for collecting solar energy. These “peaks of eternal light” are areas nearly always or constantly exposed to sunlight at the poles. They are very limited in both distribution and size (Elvis, Milligan, and Krolikowski, 2016). If a mining operation were to determine such areas suitable for their operations, or if mining created a constant plume of dust that would diminish the effectiveness of solar panels, how might such a situation be resolved?

Should potentially dangerous industries such as fuel manufacturing or storage be located near living areas? Would hydraulic fluid pipelines be closely monitored for leaks that may affect subsurface ice deposits mined for drinking water? How might vibrations from detonations affect unrelated structures or scientific instrumentation, such as telescopes? And how might a search for life, whether extinct or still living, be affected by human presence and our trail of bacteria and organic wastes? Humans’ biological pollution of Mars, for example, may greatly affect the results of any search for extraterrestrial life there (Kramer, 2009; McKay, 2009). Peter Doran of the Planetary Protection Subcommittee of the NASA Advisory Council offered, “The big issue with all missions to Mars is we don’t want to create a situation where we are impacting future life-detection science. Picture humans … walking around shedding microbes everywhere we go. Space suits as we know them do not take care of this problem (Mack, 2016).”

## 1NC – DA

#### China’s capitalizing on US vulnerabilities and ramping up ASAT development now – that emboldens Xi to invade Taiwan

Chow and Kelley 8/21 [(Brian G., policy analyst for the Institute of World Politics, Ph.D in physics from Case Western Reserve University, MBA and Ph.D in finance from the University of Michigan,and Brandon, graduate of Georgetown’s School of Foreign Service ) “China’s Anti-Satellite Weapons Could Conquer Taiwan—Or Start a War,” National Interest, 8/21/2021] JL

If current trends hold, then China’s Strategic Support Force will be capable by the late 2020s of holding key U.S. space assets at risk. Chinese military doctrine, statements by senior officials, and past behavior all suggest that China may well believe threatening such assets to be an effective means of deterring U.S. intervention. If so, then the United States would face a type of “Sophie’s Choice”: decline to intervene, potentially leading allies to follow suit and Taiwan to succumb without a fight, thereby enabling Xi to achieve his goal of “peacefully” snuffing out Taiwanese independence; or start a war that would at best be long and bloody and might well even cross the nuclear threshold.

This emerging crisis has been three decades in the making. In 1991, China watched from afar as the United States used space-enabled capabilities to obliterate the Iraqi military from a distance in the first Gulf War. The People’s Liberation Army quickly set to work developing capabilities targeted at a perceived Achilles’ heel of this new American way of war: reliance on vulnerable space systems.

This project came to fruition with a direct ascent ASAT weapons test in 2007, but the test was limited in two key respects. First, it only reached low Earth orbit. Second, it generated thousands of pieces of long-lasting space junk, provoking immense international ire. This backlash appears to have taken China by surprise, driving it to seek new, more usable ASAT types with minimal debris production. Now, one such ASAT is nearing operational status: spacecraft capable of rendezvous and proximity operations (RPOs).

Such spacecraft are inevitable and cannot realistically be limited. The United States, European Union, China, and others are developing them to provide a range of satellite services essential to the new space economy, such as in situ repairs and refueling of satellites and active removal of space debris. But RPO capabilities are dual-use: if a satellite can grapple space objects for servicing, then it might well be capable of grappling an adversary’s satellite to move it out of its servicing orbit. Perhaps it could degrade or disable it by bending or disconnecting its solar panels and antennas all while producing minimal debris.

This is a serious threat, primarily because no international rules presently exist to limit close approaches in space. Left unaddressed, this lacuna in international law and space policy could enable a prospective attacker to pre-position, during peacetime, as many spacecraft as they wish as close as they wish to as many high-value targets as they wish. The result would be an ever-present possibility of sudden, bolt-from-the-blue attacks on vital space assets—and worse, on many of them at once.

China has conducted at least half a dozen tests of RPO capabilities in space since 2008, two of which went on for years. Influential space experts have noted that these tests have plausible peaceful purposes and are in many cases similar to those conducted by the United States. This, however, does not make it any less important to establish effective legal, policy, and technical counters to their offensive use. Even if it were certain that these capabilities are intended purely for peaceful applications—and it is not at all clear that that is the case—China (or any other country) could at any time decide to repurpose these capabilities for ASAT use.

There is still time to get out ahead of this threat, but likely not for much longer. China’s RPO capabilities have, thus far, lagged about five years behind those of the United States. There are reasons to believe this gap may close, but even assuming that it holds, we should expect to see China demonstrate an operational dual-use rendezvous spacecraft by around 2025. (The first instance of a U.S. commercial satellite docking with another satellite to change its orbit occurred in February 2020.)

At the same time, China is expanding its capacity for rapid spacecraft manufacturing. The Global Times reported in January that China’s first intelligent mass production line is set to produce 240 small satellites per year. In April, Andrew Jones at SpaceNews reported that China is developing plans to quickly produce and loft a thirteen thousand-satellite national internet megaconstellation. It is not unreasonable to assume that China could manufacture two hundred small rendezvous ASAT spacecraft by 2029, possibly more.

If this happens, and Beijing was to decide in 2029 to launch these two hundred small RPO spacecraft and position them in close proximity to strategically vital assets, then China would be able to simultaneously threaten disablement of the entire constellations of U.S. satellites for missile early warning (about a dozen satellites with spares included); communications in a nuclear-disrupted environment (about a dozen); and positioning, navigation, and timing (about three dozen); along with several dozen key communications, imagery, and meteorology satellites. Losing these assets would severely degrade U.S. deterrence and warfighting capabilities, yet once close pre-positioning has occurred such losses become almost impossible to prevent. For this reason, such pre-positioning could conceivably deter the United States from coming to Taiwan’s aid due to the prospect that intervention would spur China to disable these critical space systems. Without their support, the war would be much bloodier and costlier—a daunting proposition for any president.

Should the United States fail to intervene, the consequences would be disastrous for both Washington and its allies in East Asia, and potentially the credibility of U.S. defense commitments around the globe. Worse yet, however, might be what could happen if China believes that such a threat will succeed but proves to be wrong. History is rife with examples of major wars arising from miscalculations such as this, and there are many pathways by which such a situation could easily escalate out of control to a full-scale conventional conflict or even to nuclear use.

#### Starlink development solves – mega-constellations are unjammable and accurate

Harris 20 [(Mark, Knight Science Journalism Fellow at MIT in 2013, writes about technology, science, business, the environment, and travel, internally cites Todd Humphreys, Professor of Aerospace Engineering at UT Austin, and Peter Iannucci,, Postdoctoral Research Fellow in Aerospace Engineering and Engineering Mechanics at UT Austin) “SpaceX’s Starlink satellites could make US Army navigation hard to jam,” MIT Technology Review, 9/28/2020] JL

Now, research funded by the US Army has concluded that the growing mega-constellation could have a secondary purpose: doubling as a low-cost, highly accurate, and almost unjammable alternative to GPS. The new method would use existing Starlink satellites in low Earth orbit (LEO) to provide near-global navigation services.

In a non-peer-reviewed paper, Todd Humphreys and Peter Iannucci of the Radionavigation Laboratory at the University of Texas at Austin claim to have devised a system that uses the same satellites, piggybacking on traditional GPS signals, to deliver location precision up to 10 times as good as GPS, in a system much less prone to interference.

The Global Positioning System consists of a constellation of around 30 satellites orbiting 20,000 kilometers above Earth. Each satellite continuously broadcasts a radio signal containing its position and the exact time from a very precise atomic clock on board. Receivers on the ground can then compare how long signals from multiple satellites take to arrive and calculate their position, typically to within a few meters.

The problem with GPS is that those signals are extremely weak by the time they reach Earth, and are easily overwhelmed by either accidental interference or electronic warfare. In China, mysterious GPS attacks have successfully “spoofed” ships in fake locations, while GPS signals are regularly jammed in the eastern Mediterranean.

The US military relies heavily on GPS. Last year, the US Army Futures Command, a new unit dedicated to modernizing its forces, visited Humphreys’s lab to talk about a startup called Coherent Navigation he had cofounded in 2008. Coherent, which aimed to use signals from Iridium satellites as a rough alternative to GPS, was acquired by Apple in 2015.

“They told me the Army has a relationship with SpaceX [it signed an agreement to test Starlink to move data across military networks in May] and would I be interested in talking to SpaceX about using their Starlink satellites the same way that I used these old Iridium satellites?” Humphreys says. “That got us an audience with people at SpaceX, who liked it, and the Army gave us a year to look into the problem.” Futures Command also provided several million dollars in funding.

The concept of using LEO satellites for navigation isn't new. In fact, some of the first US spacecraft launched in the 1960s were Transit satellites orbiting at 1,100 kilometers, providing location information for Navy ships and submarines. The advantage of an LEO constellation is that the signals can be a thousand times stronger than GPS. The disadvantage is that each satellite can serve only a small area beneath it, so that reliable global coverage requires hundreds or even thousands of satellites.

Building a whole new network of LEO satellites with ultra-accurate clocks would be an expensive undertaking. Bay Area startup Xona Space Systems plans to do just that, aiming to launch a constellation of at least 300 Pulsar satellites over the next six years.

Humphreys and Iannucci’s idea is different: they would use a simple software upgrade to modify Starlink’s satellites so their communications abilities and existing GPS signals could provide position and navigation services .

They claim their new system can even, counterintuitively, deliver better accuracy for most users than the GPS technology it relies upon. That is because the GPS receiver on each Starlink satellite uses algorithms that are rarely found in consumer products, to pinpoint its location within just a few centimeters. These technologies exploit physical properties of the GPS radio signal, and its encoding, to improve the accuracy of location calculations. Essentially, the Starlink satellites can do the heavy computational lifting for their users below.

The Starlink satellites are also essentially internet routers in space, capable of achieving 100 megabits per second. GPS satellites, on the other hand, communicate at fewer than 100 bits per second.

“There are so few bits per second available for GPS transmissions that they can’t afford to include fresh, highly accurate data about where the satellites actually are,” says Iannucci. “If you have a million times more opportunity to send information down from your satellite, the data can be much closer to the truth.”

The new system, which Humphreys calls fused LEO navigation, will use instant orbit and clock calculations to locate users to within 70 centimeters, he estimates. Most GPS systems in smartphones, watches, and cars, for comparison, are only accurate to a few meters.

But the key advantage for the Pentagon is that fused LEO navigation should be significantly more difficult to jam or spoof. Not only are its signals much stronger at ground level, but the antennas for its microwave frequencies are about 10 times more directional than GPS antennas. That means it should be easier to pick up the true satellite signals rather than those from a jammer.  “At least that’s the hope,” says Humphreys.

According to Humphreys and Iannucci’s calculations, their fused LEO navigation system could provide continuous navigation service to 99.8% of the world’s population, using less than 1% of Starlink’s downlink capacity and less than 0.5% of its energy capacity.

“I do think this could lead to a more robust and accurate solution than GPS alone,” says Todd Walter of Stanford University’s GPS Lab, who was not involved with the research. “And if you don’t have to modify Starlink’s satellites, it certainly is a fast, simple way to go.”

#### Taiwan goes nuclear – the US gets drawn in

The Week 1/4 [(The Week Staff, weekly news magazine with editions in the United Kingdom and United States) “What would happen if China tried to invade Taiwan?” The Week Staff, 1/4/2022] JL

If a conflict were to break out between the two neighbours it would be “a catastrophe”, reported The Economist. This is first because of “the bloodshed in Taiwan” but also because of the risk of “escalation between two nuclear powers”, namely the US and China.

Beijing massively outguns Taiwan, with estimates from the Stockholm International Peace Research Institute showing that China spends about 25 times more on its military. However, Taiwan has a defence pact with the US dating back to the 1954 Sino-American Mutual Defence Treaty, meaning the US could, in theory, be drawn into the conflict.

“Beijing’s optimistic version of events” after the decision to invade would see “cyber and electronic warfare units target Taiwan’s financial system and key infrastructure, as well as US satellites to reduce notice of impending ballistic missiles”, Bloomberg said.

“Chinese vessels could also harass ships around Taiwan, restricting vital supplies of fuel and food,” the news site continued, while “airstrikes would quickly aim to kill Taiwan’s top political and military leaders, while also immobilising local defences”.

This would be followed by “warships and submarines traversing some 130 kilometres [80 miles] across the Taiwan Strait”, before “thousands of paratroopers would appear above Taiwan’s coastlines, looking to penetrate defences [and] capture strategic buildings”.

According to satellite imagery seen by military news site The Drive, China has also begun “beefing up its combat aviation infrastructure across from Taiwan as invasion fears grow”.

Beijing “is upgrading three air bases located opposite” the island, “boosting its air power capability in an already tense region that is flush with air combat capabilities.”

“Construction of the new infrastructure began in early 2020 and continued uninterrupted through the pandemic, underlining its priority,” the site added.

Taiwan would be reliant on “natural defences” – its rugged coastline and rough sea – with plans to “throw a thousand tanks at the beachhead” in the event of a Chinese invasion that could result in “brutal tank battles” that “decide the outcome”, according to Forbes.

The island’s top military leadership has also “warned China that the closer its aircraft and ships get to the island the harder Taipei will respond”, Bloomberg reported, with “a multi-pronged approach that utilises aircraft, ships and its air defence systems to counter Chinese military incursions” in the works.

“Chinese state media has dismissed the idea of Taiwan retaliating,” the news agency added. But a report by the island’s defence ministry sent to legislators shows the island is preparing to “take tougher measures” should they be necessary.

This would all be complicated by the US pledge to defend its ally in what The Economist called a “test of America’s military might and its diplomatic and political resolve”.

Asked last week during a CNN town hall meeting whether the US would mount a military response if Beijing attempted to take the island by force, Biden responded: “Yes, we have a commitment to do that.”

The Guardian said that Biden “made a similar pledge in August”, when he told ABC News that the US has a “sacred commitment” to defend its Nato allies in Canada and Europe and it was the “same with Japan, same with South Korea, same with Taiwan”.

If the US had decided against intervention, “China would overnight become the dominant power in Asia” and “America’s allies around the world would know that they could not count on it”, the paper added. In other words, “Pax Americana would collapse”.

That would be unacceptable in Washington, especially as “Joe Biden pivots US foreign policy towards a focus on the Indo-Pacific as the main arena for 21st-century superpower competition”, The Guardian said.

Biden’s comments during the CNN event were “at odds with the long-held US policy” of “strategic ambiguity”, The Telegraph said. Historically, Washington has helped “build Taiwan’s defences” but has “not explicitly promised to come to the island’s aid”.

US manoeuvres have so far consisted of building up “large amounts of lethal military hardware”, The Guardian added, with “the steady buildup of troops and equipment and the proliferation of war games” meaning there is “more of a chance of conflict triggered by miscalculation or accident”.

The primary danger that comes with US involvement lies in the fact that both Washington and Beijing possess nuclear weapons.

Leaked documents published by The New York Times earlier this year revealed the extent of Washington’s discussions about using nuclear weapons to deter a Chinese invasion of Taiwan in the 1950s.

Provided to the paper by Daniel Ellsberg, the whistleblower behind the 1971 Pentagon Papers, the documents appeared to show an “acceptance by some US military leaders of possible retaliatory nuclear strikes on US bases”, CNN noted, raising the spectre of how the nuclear powers would square off in a 21st-century conflict.

## 1NC – DA – Short

#### JCPOA passes now – international unity and focus are key **DeYoung 2/10** [(Karen, Associate editor and senior national security correspondent for The Washington Post) **“Iran nuclear talks head toward finish line, but outcome is unclear”**, The Washington Post, 02/10/2022] **Talks between Iran and world powers over revitalizing the Iran nuclear agreement have reached their final stage and are expected to conclude one way or the other by the end of this month**, according to participants.

“I don’t know if it’s one, two or three weeks,” European Union foreign policy chief Josep Borrell said this week during a visit to Washington. But the latest round of meetings in Vienna, he said, are “certainly the last steps.”

While there is general agreement that negotiations are reaching an end state, opinions differ widely on the likely outcome.

Russia’s representative, Mikhail Ulyanov, who has adopted a generally optimistic tone since the talks started in April, said last week that negotiations should conclude “as soon as possible, preferably this month.” The talks, he said in an interview with the Russian news outlet Kommersant, had come “a long way” and were “very close to achieving” success.

A senior U.S. official, however, noted that major issues on the table remain unresolved. Negotiations are both “closer than we have been to a deal,” in that some progress has been made, and “closer than we have been to breakdown,” as time for agreement runs out, the official said. “Both outcomes are still very possible,” said the official, speaking on the condition of anonymity to comment on the sensitive diplomacy.

#### Space diplomacy directly trades off with nonproliferation agreements – finite manpower, money, and political will within the AVC

Johnson-Freeze 16 [(Joan, Professor and former Chair of National Security Affairs at the US Naval War College, Newport, Rhode Island) “Space Warfare in the 21st Century: Arming the Heavens,” Cass Military Studies, 11/8/2016] JL

 \*The plan is legislated in the AVC (same bureau of the State Department that’s concerned with the JCPOA)

Proactive policymaking takes commitment, manpower, and money. A quick look at the money and manpower devoted to diplomacy in the US State and Defense departments compared to the resources available for the hardwareproducing military–industrial complex efforts described in Chapter 5 is enlightening. The Assistant Secretary of State for Arms Control, Verification, and Compliance (AVC) leads space-related diplomacy in the State Department. The AVC Bureau is responsible for “all matters related to the implementation of certain international arms control, nonproliferation, and disarmament agreements and commitments; this includes staffing and managing treaty implementation commissions.”34 The AVC arms control portfolio includes nuclear, biological, and chemical weapons and all related issues. The AVC section charged with space issues is the Office of Emerging Security Challenges; this office also handles missile defense issues and the promotion of transparency, cooperation, and building confidence regarding cybersecurity. As of financial year 2013, AVC had a budget of $31.2 million and 141 employees35 to be active participants and leaders in all of these issues.

By way of comparison, the Space Security and Defense Program, a joint program of the DoD and the Office of the Director of National Intelligence (ODNI) was programmed for a similar budget amount in financial year 2015: $32.3 million. That program is described as a “center of excellence for options and strategies (materiel, non-materiel, cross-Title, cross-domain) leading to a more resilient and enduring National Security Space (NSS) Enterprise.”36 A majority of SSDP funding is allocated to the development of offensive space control strategies. So basically, the same budget is allocated for all US global space diplomacy efforts as for an in-house Pentagon think tank to devise counterspace strategies.

Within the Pentagon, the Deputy Assistant Secretary of Defense for Space Policy is charged with all issues related to space policy, including diplomacy. The responsibilities of the Space Policy office are to:

• Develop policy and strategy for a domain that is increasingly congested, competitive, and contested

• Implement across DoD — plans, programs, doctrine, operations — and with the IC and other agencies

• Engage with allies and other space-faring countries in establishing norms and augmenting our capabilities.37

The breadth of those responsibilities, which includes reviewing space acquisitions, means that there may be only a handful of individuals actually engaged in multilateral diplomatic efforts, acting, for example, as advisors to diplomatic discussions such as those through the United Nations. Additionally, the expanse of the Pentagon results in a chain of command that makes organizational competition for attention to subject matter challenging at best. The Deputy Assistant Secretary of Defense for Space Policy reports to the Assistant Secretary of Defense for Homeland Defense, who then reports to the Principle Deputy Secretary of Defense for Homeland Defense and Global Security, who then reports to the Under Secretary of Defense for Defense Policy. There are also a multitude of space players in other governmental organizations to coordinate and contend with, particularly within the Air Force and intelligence communities. Personnel are spread thin.

US government-wide space diplomacy needs a mandate, manpower, and a supporting budget. Diplomacy, especially multilateral diplomacy, can be timeconsuming, manpower-intensive, and frustrating; and patience is not a strong American virtue. The recent experience in the UN LTS Working Group is emblematic of everything that causes the United States to shun multilateralism. Under the auspices of this group, countries had worked in good faith over the past five years to develop technical guidelines as reciprocal constraints, as insisted upon by the developing countries when they rejected the ICOC. Yet group success appeared thwarted at the February 2016 meeting of the LTS Working Group by one country, Russia.

#### Iranian proliferation goes nuclear – causes regional war and spurs proliferation cascades across the Middle East

Chilton and Hoshovsky 20 – [(Kevin, led U.S. Strategic Command and has participated in the Jewish Institute for National Security of America’s Generals and Admirals Program; Harry, policy analyst at JINSA’s Gemunder Center for Defense and Strategy) "Avoiding a nuclear arms race in the Middle East," Defense News, 2-13-2020, <https://www.defensenews.com/opinion/commentary/2020/02/13/avoiding-a-nuclear-arms-race-in-the-middle-east/>] TDI

This raises two immediate concerns. First, **should Iran race for the bomb, it is** almost inevitable that the United States and/or Israel will take preventative military action **to stop it from crossing that fateful threshold**. This could easily spiral into a regional war as Iran activates its various proxy forces against the United States and its allies.

Second, **an Iranian nuclear breakout attempt could** spur a proliferation cascade throughout the Middle East, **beginning with Saudi Arabia.**

Mohammed bin Salman, **the Saudi crown prince, openly stated in 2018 that if Iran developed nuclear weapons**, Riyadh would quickly “follow suit.” **One suggested approach would see Saudi Arabia purchase a nuclear power reactor from a major supplier like South Korea and then build a reprocessing plant that would yield enough weapons-grade plutonium in five years**.

A half-decade delay isn’t optimal, however, when the goal is achieving nuclear deterrence quickly. Thus, there is the so-called Islamabad option.

This refers to Riyadh’s role in financing Pakistan’s nuclear weapons program and an alleged commitment from Islamabad that it would repay the favor. While Pakistani and Saudi officials have denied any such understanding, **there is the possibility that the two could work out an arrangement where Islamabad could deploy some of its nuclear arsenal on Saudi soil following a successful Iranian breakout.**

Although this maneuver would draw sharp, international criticism, in theory, it would allow Riyadh to remain in good standing vis-a-vis the nuclear nonproliferation treaty. Nevertheless, Pakistan might not be willing to play spoiler against a nuclearized Iran. If it is, Middle Eastern geopolitics would become extremely unstable.

**If Saudi Arabia acquires nuclear weapons**, many believe Turkey would follow suit. Last September, Turkish President Recep Tayyip **Erdogan declared that he “cannot accept” the argument from Western nations that Turkey should not be allowed to attain nuclear weapons.** In 1958, Charles de Gaulle proclaimed that a nation without nuclear weapons “does not command its own destiny”; two years later, France tested its first bomb. Erdogan’s comments echo those earlier remarks and raise the possibility that Ankara could become the second NATO member to leave the alliance’s nuclear umbrella in favor of its own independent arsenal.

#### Prolif cascades undermine deterrence and cause nuclear war – this is predictive of what a multi-nuclear Middle East would look like

Krepinevich 13 – [(Dr. Andrew F, the President of the Center for Strategic and Budgetary Assessments) “Critical Mass: Nuclear Proliferation in the Middle East,” 2013, <https://csbaonline.org/uploads/documents/Nuclear-Proliferation-in-the-Middle-East.pdf>] TDI

As more countries over time develop nuclear capabilities and build up their nuclear arsenals, the competition will evolve from an Israeli-Iranian affair to a multi-state rivalry. For illustrative purposes **we will assume that** in the 2025-2030 timeframe, **Iran**, **Saudi Arabia, Turkey, and perhaps Egypt** and/or Iraq **have nuclear arsenals** in the low double-digit range (i.e., ten to forty weapons). What form might a nuclear competition among these powers and Israel assume? The remainder of this chapter attempts to shed some light on this issue, and its potential implications, with emphasis on those affecting regional stability.

The challenge of preserving stability when confronted with military competition among five nuclear-armed states within the Middle East and with other powers external to the region engaged in a Great Game for influence is formidable. At first blush, one thing seems apparent: **many** Cold War-era metrics **for assessing the competition and gauging where it might be headed** appear to be of little utility; in fact, **they may actually prove misleading and dangerous**. The same can be said of those looking to apply Cold War-era arms control metrics as a way of keeping the peace in general and avoiding nuclear use in particular.

**During the Cold War, many nuclear strategists came to view nuclear parity** (the possession of roughly equivalent arsenals capable of inflicting roughly equivalent levels of destruction) **between the United States and the Soviet Union as stabilizing**. The perception of these strategists is that the rough equivalence contributed to the tradition of non-use of nuclear weapons, and was thus desirable. Parity enabled both sides to avoid the perception of being inferior to their rival, and perceptions are critical to deterrence and to preserving the confidence of one’s allies and security partners. If accepted by both sides, parity could enable them to avoid the cost and instability associated with “racing” toward ever-larger arsenals. Accordingly, maintaining parity was a major objective of U.S.-Soviet (and later U.S.-Russian) arms control negotiations. Yet irrespective of its merits, parity is not an option for states engaged in an n-player competition. Each competitor cannot have a nuclear force equivalent to all the others. Even if the competition should solidify into two coalitions so as to mimic the two-player Cold War competition, questions would almost certainly arise regarding the willingness of a coalition partner that has not been attacked to risk its own destruction by using its nuclear weapons in response to an attack on its ally. Indeed, these concerns were raised during the Cold War, and formed a major justification for France pursuing its own force de frappe. 93

**In a Middle Eastern “n-player” competition, all nuclear powers would be** challenged to establish an “assured destruction” capability **against all the other regional nuclear powers**, another Cold War desideratum, **given their relatively modest economies. An “assured destruction” capability in an n-state competition would require that each state have weapons sufficient to survive an initial attack by all potential rivals and still be able to devastate the countries of all attackers**. It would also require that the source of the attack be reliably identified. As noted earlier, this may prove difficult given likely limitations on these states’ ability to field advanced early warning systems. For example, would Israel be able to determine with confidence the owner of a ballistic missile launched from a location along the Iranian-Turkish border? The origin of any cruise missile launched from a sea-based platform? Even assuming a state could identify the source (or sources) of an attack, could its command and control systems survive the attack sufficiently intact to execute a retaliatory strike? **A decapitation strike could preclude an “assured destruction” retaliatory strike even if sufficient weapons survive to execute one.**

**This, in turn,** raises the possibility of a “catalytic” war**—one that is initiated between two states by a third party. Given a proliferated Middle East as described above, the chances that a regime would incorrectly attribute the source of an attack cannot be easily dismissed. To the extent** cyber weapons can introduce false information **into a state’s decision-making process, the risks of catalytic war only increase.**

Further complicating matters, **the early warning requirement following a proliferation cascade could be multidirectional, and at some point perhaps 360 degrees**, especially if nuclear rivals begin deploying a portion of their nuclear forces at sea. **Early warning requirements would be stressed even further** (and the costs of such a system increase correspondingly) **if a neighboring state** (e.g., Iran in the case of Turkey or Iraq; Turkey in the case of Israel; etc.) **were to acquire nuclear weapons**. In this case warning times would be even more compressed than in an Israeli-Iranian competition. Owing to its proximity to Iran, **Saudi Arabia**, for example, **could have less than five minutes to react to an Iranian ballistic missile attack no matter how advanced its early warning and command and control systems are.**

As noted earlier in this assessment, regardless of what assumptions are made regarding a regional nuclear power’s early warning system, given the short ballistic missile flight times it seems likely that preserving command and control of the state’s nuclear forces while under attack will prove challenging. **States might be tempted to adopt a launch-on-warning posture**, but this requires both early warning and a highly responsive command and control system. Should a state determine that it will not be able to launch-on-warning and instead attempt to “ride-out” a nuclear first strike and retaliate, it would still need its command and control system to function effectively in the wake of the nuclear attack. **Absent a highly resilient command and control system,** a state’s ability to launch a retaliatory **nuclear strike** may require nuclear release authority to be diffused to lower-level commanders. But again, absent an effective early warning system it may not be possible to determine the attack source with confidence in a region with multiple nuclear powers.

## Case

### Debris

#### No solvency— Silverman 21 proves that Elon won’t listening to the plan or any agreement, means he just finds other ways to do it.

#### No nuclear collisions— there aren’t nuclear satellites in space now

#### No china war— squo debris thumps and china has no inscentive to strike.

#### Debris creates deterrence by raising the bar for conflict – international norms fail

Miller 7/31 [(Gregory, Chair of the Department of Space Power at the Air Command and Staff College, Ph.D. in Political Science from The Ohio State University) “Deterrence by Debris: The Downside to Cleaning up Space,” Space Policy, 7/31/2021] JL

The danger of kinetic strikes increasing orbital debris is a common theme in the literature, but the positive deterrent effects of some debris are often overlooked. The debris resulting from destroyed satellites, or other space objects, creates a deterrent effect on actors who might otherwise violate international norms and strike at objects in space, either to test their capabilities or as an act of hostilities. This is not deterrence in the traditional sense, of one actor publicly threatening punishment in response to another actor’s unwanted actions. It is not deterrence by denial since the attacker is not damaged and may even achieve its objective. Nor is it deterrence by punishment because the debris itself does not threaten to punish the attacker’s country. But debris can increase the future costs to the aggressor, even if their initial attack succeeds, and thus it has a similar restraining effect on certain behavior. Like the automated response of the U.S. tripwire in West Germany, the threat that debris can pose to state interests acts as a form of deterrence, at least to prevent some actors from taking certain types of actions. Removing the danger of debris will weaken that restraint and thus weaken deterrence, making ASAT tests and hostile actions in space more likely.

Several factors may deter a state from launching kinetic tests or striking against an adversary’s interests in space. For one thing, if a state’s adversary has similar capabilities to destroy objects in space, deterrence would be a function of not wanting to escalate tensions. Although international law only explicitly prohibits states from placing weapons of mass destruction in orbit, international space law, like the Outer Space Treaty [30], does provide a framework for addressing the activities of one state that lead to the damage of another state’s property. Likewise, there are international norms (informal but expected rules of behavior) against the weaponization of space. But these norms seem to be in decline [31], and such norms only deter a state from engaging in certain types of behavior if the state cares about following norms, if it cares about how states perceive its behavior, or if it believes other states are willing to enforce the norms. The beauty of debris as a deterrent is that it does not rely on the enforcement of norms or the credibility of states to succeed.

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

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

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

#### Orbit alteration and autonomous avoidance solve collisions – independently, Russian ASAT tests thump debris

Kan 12/1 [(Michael, PCMag reporter since October 2017, covers a wide variety of news topics, including consumer devices, the PC industry, cybersecurity, online communities, and gaming) “Starlink Satellite Orbits Changed to Avoid Debris After Russia's Missile Test,” PC Magazine, 12/1/2021] JL

SpaceX has altered the orbits for its [Starlink](https://www.pcmag.com/how-to/what-is-starlink-spacex-satellite-internet-service-explained) satellites, likely to prevent them from colliding with debris from Russia’s anti-satellite missile test.

On Tuesday, SpaceX CEO Elon Musk mentioned the issue after NASA abruptly delayed a spacewalk on the International Space Station due to the threat of space debris. In his [tweet](https://twitter.com/elonmusk/status/1465761470147346435?s=20), Musk said: “We had to shift some Starlink satellite orbits to reduce probability of collision. Not great, but not terrible either.”

Musk didn’t explicitly blame the space debris on Russia’s anti-satellite missile test. Nevertheless, the “Not great, but not terrible” quote may be a subtle jab at the Russian government. The [same line](https://www.youtube.com/watch?v=Mg5HOnq7zD0) is used in the HBO series *Chernobyl*, which dramatizes the 1986 nuclear plant disaster in the Soviet Union. (In the show, a nuclear plant worker utters the line “Not great, but not terrible,” when in reality the conditions at the facility are catastrophic.)

Last month, the US was quick to [condemn](https://www.pcmag.com/news/report-russian-anti-satellite-weapons-test-causes-dangerous-space-debris) Russia’s anti-satellite missile test, which involved the Kremlin sending up a missile to destroy one of its own defunct satellites. The ensuing impact caused hundreds of thousands of pieces of debris to spill out into orbit, according to the US.

Because space debris can travel up to 17,500 miles per hour, even a small artifact can cause serious damage if strikes a spacecraft or an astronaut. "Russia's dangerous and irresponsible behavior jeopardizes the long-term sustainability of outer space,” the US State Department said at the time.

However, Russia [claims](https://tass.com/science/1362125) the resulting debris poses no danger to any space activity. The Kremlin also points out other countries have embarked on their own anti-satellite missile tests too.

To avoid space debris, SpaceX has equipped each Starlink satellite with an “autonomous collision avoidance” system. The same satellites will eventually descend and burn up in Earth’s atmosphere within one to five years if the propulsion system on board ever fails.

#### No impact to debris – it hits stations all the time.

Cain ’15 (Fraser; 12/23/15; writer for Universe Today; “How Do Astronauts Avoid Debris”; http://www.universetoday.com/121067/how-do-astronauts-avoid-debris)

So, just how do we keep our space stations, ships and astronauts from being riddled with holes from all of the space junk in orbit around Earth? We revel in the terror grab bag of all the magical ways to get snuffed in space. Almost as much as we celebrate the giant brass backbones of the people who travel there. We’ve already talked about all the scary ways that astronauts can die in space. My personal recurring “Hail Mary full of grace, please don’t let me die in space” nightmare is orbital debris. We’re talking about a vast collection of spent rockets, dead satellites, flotsam, jetsam, lagan and derelict. It’s not a short list. NASA figures there are **21,000 bits of junk** bigger than 10 cm, **500,000 particles** between 1 and 10 cm, and more than **100 million** smaller than 1 cm. Sound familiar, humans? This is our high tech, sci fi great Pacific garbage patch. Sure, a tiny rivet or piece of scrap foil doesn’t sound very dangerous, but consider the fact that astronauts are orbiting the Earth at a velocity of about 28,000 km/h. And the Tang packets, uneaten dehydrated ice cream, and astronaut poops are also traveling at 28,000 km/h. Then think about what happens when they collide. Yikes… or yuck. Here’s the International Space Station’s solar array. See that tiny hole? Embiggen and clarinosticate! That’s a tiny puncture hole made in the array by a piece of orbital crap. The whole station is **pummeled by tiny pieces of space program junk drawer contents**. Back when the Space Shuttle was flying, NASA had to **constantly replace their windows because of the damage they were experiencing** from the orbital equivalent of Dennis the Menace hurling paint chips, fingernail clippings, and frozen scabs.

#### Alliances check miscalc – too costly

MacDonald 13 [(Bruce, teaches at the United States Institute of Peace on strategic posture and space/cyber security issues, leads a study on China and Crisis Stability in Space, and is adjunct professor at the Johns Hopkins School of Advanced International Studies) “Deterrence and Crisis Stability in Space and Cyberspace,” in Anti-satellite Weapons, Deterrence and Sino-American Space Relations, September 2013, https://apps.dtic.mil/dtic/tr/fulltext/u2/a587431.pdf] TDI

The US alliance structure can promote deterrence and crisis stability in space, as with nuclear deterrence. China has no such alliance system. If China were to engage in large-scale offensive counter-space operations, it would face not only the United States, but also NATO, Japan, South Korea and other highly aggrieved parties. Given Beijing’s major export dependence on these markets, and its dependence upon them for key raw material and high technology imports, China would be as devastated economically if it initiated strategic attacks in space. In contrast to America’s nuclear umbrella and extended deterrence, US allies make a tangible and concrete contribution to extended space deterrence through their multilateral participation in and dependence upon space assets. Attacks on these space assets would directly damage allied interests as well as those of the United States, further strengthening deterrent effects.

### Ozone

#### Other satellites thump the ozone impact— the card is about the materials that all satellites have, means that your impact would have already happened & your ev is just about rockets, mean anything can solve.

#### No ozone— your ev is about total ozone collapse while starlink sats are only being launched from kennedy space station in the US.

#### No Grossman cross application— that card is about radiation from a nuclear weapon not the radiation from a spacecraft— they’re distinct.

#### Data not key to solve warming – and it’s not used anwyays!

**Starr 14** - psychologist, journalist, and professor emeritus at the City University of New York, Brooklyn College (Bernard, “Our Oceans Are Dying: Mobilizing an Indifferent Public to Confront This Crisis,” Huffington Post, 6-27-14, http://www.huffingtonpost.com/bernard-starr/our-oceans-are-dying\_b\_5533322.html) //

After an eighteen-month investigation, the Commission, made up of former heads of state, government officials, and prominent business leaders concluded that our oceans are dying from climate change, pollution, and over-fishing. The Commission proposes an eight point program to rescue the oceans over the next five years. Why should we be concerned? José María Figueres, Co-chair of the Commission and former president of Costa Rica, has summed up the dire situation with these words: "The ocean provides 50 percent of our oxygen and fixes 25 percent of global carbon emissions. Our food chain begins in that 70 percent of the planet." He added that "a healthy ocean is key to our well-being, and we need to reverse its degradation." He warned: "Unless we turn the tide on ocean decline within five years, the international community should consider turning the high seas into an off-limits regeneration zone until its condition is restored." A Commission video states the crisis even more starkly: "No ocean, no us!" In his brief talk at the reception, David Miliband, also co-chair of the Ocean Commission and former UK Foreign Secretary, urged politicians, scientists, journalists, and ordinary citizens to rally behind the salvation of our oceans and the planet -- and to get the message out to others. Will getting the message out turn the tide in the battle to save the planet? I doubt it. **We are swimming in information and messages**. Earlier the this year leading scientists declared that we are fast approaching the critical point of no return for climate change -- a point with predictable devastating consequences. But **who is listening?** The public continues to be **frighteningly indifferent**. Who among the public is willing to place the salvation of the planet over immediate personal concerns? That question was dramatically called to my attention recently when I presented a list of critical issues to a group of seniors enrolled in a life-long learning program and asked them which one they would place first. The list included: terrorism and national defense, global warming, jobs, vanishing icebergs, protecting Social Security, income inequality, ocean pollution, sustaining Medicare, protecting the Amazon rain forests, reducing fossil fuel emissions, regulating Wall Street and the banks, stopping fracking (shale gas drilling), protecting wildlife (elephants, lions, whales, etc.), eliminating genetically modified foods (GMOs), campaign finance reform, free college education for all, national healthcare (Medicare for all). I was particularly interested in the seniors' answers since popular wisdom says that seniors are more concerned than other age groups with the welfare of children, grandchildren, and future generations. And no issue is more vital for the well-being of future generations than the viability of life on the planet. Psychologist Erik Erikson called this concern of older adults "generativity." But the seniors defied conventional wisdom. Jobs, Social Security, and income inequality topped their listings. Only one person, toward the end of the discussion, cited climate change -- and his response seemed almost gratuitous in recognition that we were about to screen a documentary on the melting of icebergs. Perhaps I should not have been surprised. Politicians avoid talking about environmental issues for fear of losing favor with their constituents, who are clamoring for jobs, mortgage relief, and financial security. During the 2012 presidential debates between Barack Obama and Mitt Romney environmental issues took a far **back** seat; in fact, they were barely mentioned. Both candidates knew instinctively that in the throes of an economic crisis placing the salvation of the planet high on the national agenda would not generate votes. It might even take away votes from people who feared the candidate would be indifferent to their personal struggles. So where does this leave us? If more environmental studies and more alarming news will not mobilize leaders and the public for an all-out commitment to the preservation of our small vulnerable corner of the universe, what will? Perhaps we need to shift our focus from information to changing human behavior. Let's enlist leading behavioral scientists and psychological associations to address how to awaken the public to the urgency of protecting the planet. Let's launch a campaign to make this the number-one priority. And let's adopt these mantras: No planet, no jobs; no planet, no Social Security; no planet, no mortgages; no planet, no corporate bonus packages. No planet, no us.

#### **The ozone is resilient and improving now:**

Sustainability for All nd [(Sustainability for All - international organization working in partnership with the United Nations, leaders in government, the private sector, financial institutions and civil society with as goal to drive further, faster action toward the achievement of Sustainable Development Goal 7, which calls for universal access to sustainable energy by 2030, and the Paris Agreement, which calls for reducing greenhouse gas emissions to limit climate warming to below 2° Celsius) “WHY THE OZONE LAYER IS NO LONGER AT RISK” nd]

In the mid-Seventies, a group of scientists warned about the gradual destruction of the ozone layer that protects the planet from ultraviolet radiation. In 1985, an article in Nature magazine by British Antarctic Survey scientists alerted that a hole had appeared in the ozone layer over the South Pole, where the gas had been reduced by 50%. From this moment on, the hole in the ozone layer became a crucial question in the fight to conserve the environment.

Why had this ozone gas diminished? The main cause was the growing use of chlorofluorocarbons, known as CFCs, which was provoking more ozone loss than was being formed, lowering its concentration. CFCs consisted of chemical substances that were used in everyday items such as refrigeration devices (domestic fridges, air conditioning, industrial freezers) and aerosols (deodorants, spray paint, insecticides, lacquers, etc.).

As well as CFCs, of which 12 different types exist, there are other gases of human origin that endanger the ozone layer, such as methyl chloroform (used in paints and solvents), carbon tetrachloride (present in pesticides, fire extinguishers and bleaches) and substances made of bromine, such as halons, used, for example, to put out fires.

Why damaging the ozone layer is dangerous

Ozone concentration is present in 90% of the upper layers of the atmosphere and is essential for the development of life, since it filters all ultraviolet radiation. This vital function for life on earth prevents us from being over-exposed to the ultraviolet rays which will harm our health.

The ozone layer protects human beings and other species from diseases such as skin cancer, melanomas, cataracts in the eyes and suppression of the immune system. Its destruction also damages crops sensitive to ultraviolet radiation.

Montreal Protocol, a turning point

Two decades ago, in 1987, an international pact known as the Montreal Protocol represented a milestone in global environmental policy, a unanimous agreement to reduce production and consumption of the noxious substances destroying the ozone layer.

Why the ozone layer is no longer at risk

Since it entered into force in 1989, CFCs have mainly been replaced by HCFCs (hydrochlorofluorocarbons), which although these also have a negative impact on the greenhouse effect, at least they do not damage the ozone layer.

The Montreal Protocol is considered one of the great successes of international cooperation in fighting to conserve the environment, and is a clear example of how a global pact can incentivize countries to continue working together.

The ozone layer is recovering

Thanks to the measures adopted in the Montreal Protocol, the ozone layer is recovering. According to a report by MIT (Massachusetts Institute of Technology), since the year 2000, the moment at which the ozone concentration fell to its lowest in history, the hole has reduced by four million square kilometres.

The hole in the ozone layer has shrunk by four million square kilometres since 2000

The scientific community estimates that, if it continues this rate of recovery, in 2050 the hole will have completely closed, i.e. the concentration of ozone gas will have returned to be the same over the South Pole as before human action provoked its change.

Paradoxically, according to UNEP (the United Nations Environment Programme), if the Montreal Protocol had not been signed, in 2050 the hole in the ozone layer would have grown ten times bigger than at the time it was discovered.

To raise awareness on the importance of caring for the ozone layer, every 16 September the global community celebrates the International Day for the Preservation of the Ozone Layer.