### 1

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

#### Private appropriation of extracted space resources is distinct from appropriation “of” outer space. Despite longstanding permission of appropriation of extracted resources, sovereign claims are still universally prohibited

Abigail D. Pershing, J.D. Candidate @ Yale, B.A. UChicago,’19, "Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary International Law from 1967 to Today," Yale Journal of International Law 44, no. 1

II. THE FIRST SHIFT IN CUSTOMARY INTERNATIONAL LAW’S INTERPRETATION OF THE NON-APPROPRIATION PRINCIPLE Since the drafting of the Outer Space Treaty, several States have chosen to reinterpret the non-appropriation principle as narrower in scope than its drafters originally intended. This reinterpretation has gone largely unchallenged and has in fact been widely adopted by space-faring nations. In turn, this has had the effect of changing customary international law relating to the non-appropriation principle. Shifting away from its original blanket application in 1967, States have carved out an exception to the non-appropriation principle, allowing appropriation of extracted space resources.53 This Part examines this shift in the context of the two branches of the United Nation’s customary international law standard: State practice and opinio juris. A. State Practice The earliest hint of a change in customary international law relating to the interpretation of the non-appropriation clause came in 1969, when the United States first sent astronauts to the moon. As part of his historic journey, astronaut Neil Armstrong collected moonrocks that he brought back with him to Earth and promptly handed off to the National Aeronautics and Space Administration (NASA) as U.S. property.54 Later, the USSR similarly claimed lunar material as government property, some of which was eventually sold to private citizens. 55 These first instances of space resource appropriation did not draw much attention, but they presented a distinct shift marking the beginning of a new period in State practice. Having previously been limited by their technological capabilities, States could now establish new practices with respect to celestial bodies. This was the beginning of a pattern of appropriation that slowly unfolded over the next few decades and has since solidified into the general and consistent State practice necessary to establish the existence of customary international law. Currently, the U.S. government owns 842 pounds of lunar material.56 There is little question that NASA and the U.S. government consider this material, as well as other space materials collected by American astronauts, to be government property.57 In fact, NASA explicitly endorses U.S. property rights over these moon rocks, stating that “[l]unar material retrieved from the Moon during the Apollo Program is U.S. government property.”5 The U.S. delegation’s reaction to the language of the 1979 Moon Agreement further cemented this interpretation that appropriation of extracted resources is a permissible exception to the non-appropriation clause of Article II. Although the United States is not a party to the Moon Agreement, it did participate in the negotiations.59 The Moon Agreement states in relevant part: Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or nongovernmental organization, national organization or nongovernmental entity or of any natural person.60 In response to this language, the U.S. delegation made a statement laying out the American view that the words “in place” imply that private property rights apply to extracted resources61—a comment that went completely unchallenged. That all States seemed to accept this point, even those bound by the Moon Agreement, is further evidence of a shift in customary international law.62 B. Opinio Juris: Domestic Legislation Domestic law, both in the United States and abroad, provides further evidence of the shift in customary international law surrounding the issue of nonappropriation as it relates to extracted space resources. Domestic U.S. space law is codified at Section 51 of the U.S. Code and has been regularly modified to expand private actors’ rights in space.63 Beginning in 1984, the Commercial Space Launch Act provided that “the United States should encourage private sector launches and associated services.”64 The goal of the 1984 Act was to support commercial space launches by private companies and individuals.65 It did not, however, specifically discuss commercial exploitation of space. The first such mention of commercial use of space appeared in 2004, with the Commercial Space Launch Amendments Act.66 This Act specifically aimed at regulating space tourism but did not explicitly guarantee any private rights in space.67 The most significant change in U.S. space law came with the passage of the Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act in 2015. As incorporated into Section 51 of the Code, this Act provides: A United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.68 Whereas the idea that private corporations might go into space may have seemed far-fetched to the drafters of the Outer Space Treaty, the SPACE Act of 2015 was the first instance of a government recognizing such a trend and officially supporting private companies’ commercial rights to space resources under law. With the new 2015 amendment to Section 51 in place, U.S. companies can now rest assured that any profits they reap from space mining are firmly legal—at least within U.S. jurisdictions. Although the United States was the first country to officially reinterpret the non-appropriation principle, other countries are following suit. On July 20, 2017, Luxembourg passed a law entitled On the Exploration and Utilization of Space Resources with a vote of fifty-five to two.69 The law took effect on August 1, 2017.70 Article 1 of the new law states simply that “[s]pace resources can be appropriated,” and Article 3 expressly grants private companies permission to explore and use space resources for commercial purposes.71 Official commentary on the law establishes that its goal is to provide companies with legal certainty regarding ownership over space materials—a goal that the commentators regard as legal under the Outer Space Treaty despite the non-appropriation principle.72 The next country to enact similar legislation may be the United Arab Emirates (UAE). According to the UAE Space Agency director general, Mohammed Al Ahbabi, the UAE is currently in the process of drafting a space law covering both human space exploration and commercial activities such as mining.73 To further this goal, in 2017 the UAE set up the Space Agency Working Group on Space Policy and Law to specify the procedures, mechanisms, and other standards of the space sector, including an appropriate legal framework.74 C. Opinio Juris: Legal Scholarship Other major space powers are also considering similar laws in the future, including Japan, China, and Australia. 75 Senior officials within China’s space program have explicitly stated that the country’s goal is to explore outer space and to take advantage of outer space resources.76 The general international trend clearly points in this direction in anticipation of a potential “space gold rush.” 7 Mirroring the shift in State practice and domestic laws, the legal community has also changed its approach to the interpretation of the nonappropriation principle. Whereas at the time of the ratification of the Outer Space Treaty the majority of legal scholars tended to apply the non-appropriation principle broadly, most legal scholars now view appropriation of extracted materials as permissible.78 Brandon Gruner underscores that this new view is historically distinct from prior legal interpretation, noting that modern interpretations of the Outer Space Treaty’s non-appropriation principle differ from those of the Treaty’s authors.79 In contrast to earlier legal theory that denied the possibility of appropriation of any space resources, scholars now widely accept that extracting space resources from celestial bodies is a “use” permitted by the Outer Space Treaty and that extracted materials become the property of the entity that performed the extraction.80 Stressing the fact that the Treaty does not explicitly prohibit appropriating resources from outer space, other authors conclude that the use of extracted space resources is permitted, meaning that the new SPACE Act is a plausible interpretation of the Outer Space Treaty.81 However, scholars have been careful to cabin the extent to which they accept the legality of appropriation. For instance, although Thomas Gangale and Marilyn Dudley-Rowley acknowledge the legality of private appropriation of extracted space resources, they nonetheless emphasize that “[o]wnership of and the right to use extraterrestrial resources is distinct from ownership of real property” and that any such claim to real property is illegal.82 Lawrence Cooper is also careful to point out this distinction: “[t]he [Outer Space] Treaties recognize sovereignty over property placed into space, property produced in space, and resources removed from their place in space, but ban sovereignty claims by states; international law extends this ban to individuals.”83 Although there remain some scholars who still insist on the illegality of the 2015 U.S. law and State appropriation of space resources generally,84 their dominance has waned since the 1960s. These scholars are now a minority in the face of general acceptance among the legal community that minerals and other space resources, once extracted, may be legally claimed as property. 85 Taken together, the elements described above—statements made in the international arena, de facto appropriation of space resources in the form of moon rocks, the adoption of new national policies permitting appropriation of extracted space resources, and the weight of the international legal community’s opinion— indicate a fundamental shift in customary international law. The Outer Space Treaty’s non-appropriation clause has been redefined via customary international law norms from its broad application to now include a carve-out allowing appropriation of space resources once such resources have been extracted.

#### Their moon treaty solvency advocate doesn’t solve this bc it bans ownership UNLESS “that organization is international and governmental” – they still violate even if their solvency card solves bc of the squo

#### Violation: They defend mining

#### Standards:

#### [1] Limits – their interpretation means that affs about any outer space activity would be topical: tourism, mining, photography, rovers, ice cores, satellites, debris, can’t sell rocks on EBAY, etc. This explodes neg prep burdens since outer space activity is so vague– large caselists results in shallow debates and pushes argumentation to the fringes to find broad theses that disagree with everything. That prevents rigorous argument testing – anyone can skim a Wikipedia article, but the process of clash is unique to debate. At best the aff’s extra T which links to limits since the aff gets extra-T planks to solve negative DAs.

#### [2] Precision – the counter-interp justifies them arbitrarily doing away with random words in the resolution which decks negative ground and preparation because the aff is no longer bounded by the resolution. Independent voter for jurisdiction – the judge doesn’t have the jurisdiction to vote aff if there wasn’t a legitimate aff.

#### TVA – resource extraction and colonization affs that have senses of permanence, ie. No private appropriation of extracted space resources included

#### Voters:

#### [1] Fairness – constitutive to the judge to decide the better debater, only fairness is in your jurisdiction because it skews decision making

#### [2] Education – the only portable education from debate that we care about

#### Drop the debater – 1] deter future abuse and 2] set better norms for debate.

#### Competing Interps:

#### [1] reasonability on t is incoherent: you’re either topical or you’re not – it’s impossible to be 77% topical, links to all limits offense

#### [2] functionally the same as reasonability – we debate over a specified briteline which is a counter interp

#### [3] judge intervention – judge has to intervene on what’s reasonable, creates a race to the bottom where debaters exploit judge tolerance for questionable argumentation.

#### No RVIs

#### [1] illogical for you to get offense just for being fair – it’s the 1ac’s burden

#### [2] baiting - rvi’s incentivize debaters to read abusive positions to win off theory

#### [3] discourages checking abuse since debaters will be afraid to lose on theory

### 2

#### CP Text: Companies should use basic precaution measures to prevent harm from space dust.

#### Recutting of their own card - author concludes that techniques such as bagging are key to prevent dust from escaping. Author also says that this is essential to preserve uncluttered space and it solves sufficient for the advantage.

1AC Scoles ’15 [Sarah Scoles, 5-27-2015, "Dust from asteroid mining spells danger for satellites," New Scientist, [https://www.newscientist.com/article/mg22630235-100-dust-from-asteroid-mining-spells-danger-for-satellites/]//](https://www.newscientist.com/article/mg22630235-100-dust-from-asteroid-mining-spells-danger-for-satellites/%5d//) recut akhileshp

IF THE gold mine is too far from home, why not move it nearby? It sounds like a fantasy, but would-be miners are already dreaming up ways to drag resource-rich space rocks closer to home. Trouble is, that could threaten the web of satellites around Earth. Asteroids are not only stepping stones for cosmic colonisation, but may contain metals like gold, platinum, iron and titanium, plus life-sustaining hydrogen and oxygen, and rocket-fuelling ammonia. Space age forty-niners can either try to work an asteroid where it is, or tug it into a more convenient orbit. NASA chose the second option for its [Asteroid Redirect Mission](http://www.nasa.gov/content/what-is-nasa-s-asteroid-redirect-mission/), which aims to [pluck a boulder from an asteroid’s surface](https://www.newscientist.com/article/dn27243-rock-grab-from-asteroid-will-aid-human-mission-to-mars/) and relocate it to a stable orbit around the moon. But an asteroid’s gravity is so weak that it’s not hard for surface particles to escape into space. Now a new model warns that debris shed by such transplanted rocks could intrude where many defence and communication satellites live – in geosynchronous orbit. According to [Casey Handmer](http://www.caseyhandmer.com/) of the California Institute of Technology in Pasadena and Javier Roa of the Technical University of Madrid in Spain, 5 per cent of the escaped debris will end up in regions traversed by satellites. Over 10 years, it would cross geosynchronous orbit 63 times on average. A satellite in the wrong spot at the wrong time will suffer a damaging high-speed collision with that dust. The study also looks at the “catastrophic disruption” of an asteroid 5 metres across or bigger. Its total break-up into a pile of rubble would increase the risk to satellites by more than 30 per cent ([arxiv.org/abs/1505.03800](http://arxiv.org/abs/1505.03800)). That may not have immediate consequences. But as Earth orbits get more crowded with spent rocket stages and satellites, we will have to worry about [cascades of collisions](https://www.newscientist.com/article/mg20727772-300-space-junk-hunting-zombies-in-outer-space/) like the one depicted in the movie Gravity. Handmer and Roa want to point out the problem now so that we can find a solution before any satellites get dinged. “It is possible to quantify and manage the risk,” says Handmer. “A few basic precautions will prevent harm due to stray asteroid material.” Mike Nolan of the [Arecibo Observatory in Puerto Rico](http://www.naic.edu/general/) agrees it’s an important issue. “They’re right to consider it,” he says, “and their first stab indicates that the answer isn’t obviously ‘don’t worry’.” However, the risk is less concerning for asteroids not in this particular lunar orbit, he says. Aspiring space miners are taking the risk seriously. “We will be utilising containment techniques,” says Meagan Crawford of Deep Space Industries, a California-based firm which hopes to be mining metals from asteroids by 2020. One possibility is bagging, in which the asteroid is placed in a kind of shroud to prevent dust and loose stones from escaping. “All of our mining targets will be chosen specifically to minimise the risk of particulate interaction with other bodies,” she says. The risk from NASA’s mission, planned for the 2020s, is small, Nolan points out. But if space mining takes off, things will get complicated. “The establishment of good asteroid mining practices early on is essential for the preservation of a non-renewable resource: uncluttered space,” says Handmer.

### 3

#### Asteroid mining solves water access – only near-earth objects are sufficiently proximate and hydrated – the plan independently harms this – turns case

Tillman 19 [(Nola Taylor, has been published in Astronomy, Sky & Telescope, Scientific American, New Scientist, Science News (AAS), Space.com, and Astrobiology magazine, BA in Astrophysics) “Tons of Water in Asteroids Could Fuel Satellites, Space Exploration,” Space, 9/29/2019] JL

When it comes to mining space for water, the best target may not be the moon: Entrepreneurs' richest options are likely to be asteroids that are larger and closer to Earth.

A recent study suggested that roughly 1,000 water-rich, or hydrated, asteroids near our planet are easier to reach than the lunar surface is. While most of these space rocks are only a few feet in size, more than 25 of them should be large enough to each provide significant water. Altogether, the water locked in these asteroids should be enough to fill somewhere around 320,000 Olympics-size swimming pools — significantly more than the amount of water locked up at the lunar poles, the new research suggested.

Because asteroids are small, they have less gravity than Earth or the moon do, which makes them easier destinations to land on and lift off from. If engineers can figure out how to mine water from these space rocks, they could produce a source of ready fuel in space that would allow spacecraft designers to build refuelable models for the next generation of satellites. Asteroid mining could also fuel human exploration, saving the expense of launching fuel from Earth. In both cases, would-be space-rock miners will need to figure out how to free the water trapped in hydrated minerals on these asteroids.

"Most of the hydrated material in the near-Earth population is contained in the largest few hydrated objects," Andrew Rivkin, an asteroid researcher at Johns Hopkins University Applied Physics Research Laboratory in Maryland, told Space.com. Rivkin is the lead author on the paper, which estimated that near Earth asteroids could contain more easily accessible water than the lunar poles.

According to the United Nations Office for Outer Space Affairs, more than 5,200 of the objects launched into space are still in orbit today. While some continue to function, the bulk of them buzz uselessly over our heads every day. They carry fuel on board, and when they run out, they are either lowered into destructive orbits or left to become space junk, useless debris with the potential to cause enormous problems for working satellites. Refueling satellites in space could change that model, replacing it with long-lived, productive orbiters.

"It's easier to bring fuel from asteroids to geosynchronous orbit than from the surface of the Earth," Rivkin said. "If such a supply line could be established, it could make asteroid mining very profitable."

Hunting for space water from the surface of the Earth is challenging because the planet's atmosphere blocks the wavelength of light where water can be observed. The asteroid warming as it draws closer to the sun can also complicate measurements.

Instead, Rivkin and his colleagues turned to a class of space rocks called Ch asteroids. Although these asteroids don't directly exhibit a watery fingerprint, they carry the telltale signal of oxidized iron seen only on asteroids with signatures of water-rich minerals, which means the authors felt confident assuming that all Ch asteroids carry this rocky water.

Based on meteorite falls, a previous study estimated that Ch asteroids could make up nearly 10% of the near-Earth objects (NEOs). With this information, the researchers determined that there are between 26 and 80 such objects that are hydrated and larger than 0.62 miles (1 km) across.

Right now, only three NEOs have been classified as Ch asteroids, although others have been spotted in the asteroid belt. Most NEOs are discovered and observed at wavelengths too short to reveal the iron band that marks the class. Carbon-rich asteroids, which include Ch asteroids and other flavors, are also darker than the more common stony asteroids, making them more challenging to observe.

Although Ch asteroids definitely contain water-rich minerals, that doesn’t necessarily mean that they will always be the best bet for space mining. It comes down to risk. Would an asteroid-mining company rather visit a smaller asteroid that definitely has a moderate amount of water, or a larger one that could yield a larger payday but could also come up dry?

"Whether getting sure things with no false positives, like the Ch asteroids, is more important or if a greater range of possibilities is acceptable with the understanding that some asteroids will be duds is something the miners will have to decide," Rivkin said.

In addition to estimating the number of large, water-rich asteroids might be available, the study also found that as many as 1,050 smaller objects, roughly 300 feet (100 meters) across, may also linger near Earth. Their small bulk will make them easier to mine because their low gravity will require less fuel to escape from, but they will produce less water overall, and Rivkin expects that the handful of larger space rocks will be the first targets.

"It seems likely that the plan for these companies will be to find the largest accessible asteroid with mineable material with the expectation that it will be more cost-effective than chasing down a large number of smaller objects," Rivkin said. "How 'accessible' and 'mineable material' and 'cost-effective' are defined by each company is to be seen."

#### Asteroid mining solves climate change through solar-powered satellites – provides infrastructure for existing tech

**Faure 11** (Jamie Faure, 7-15-2011, "Can space-based solar power save the climate? – Young Scientists Journal," No Publication, <https://ysjournal.com/can-space-based-solar-power-save-the-climate/>) // VS

Introduction How shall we tackle climate change? This is still an unresolved question. Here, I will put forward an idea and argue its case. Burning fuels creates carbon dioxide, which thickens the atmosphere. Consequently, an increasing amount of the Sun’s heat is trapped. So, to tackle climate change, we must stop burning fuels. However, fuel is needed for energy. Therefore, we (can use) need to find other sources of energy that do not adversely impact the environment. Space-based Solar Power What I think has the most potential in reducing global warming is Space-based Solar Power (SBSP) . This technology involves placing solar satellites in space, where their energy production is unaffected by seasons, weather, the day and night cycle, and the filtering effect of the Earth’s atmosphere, learn more at solar the gap. The Sun’s energy for us is virtually unlimited (around 5 billion years to go). In addition, the satellites are placed nearer to the Sun in space than to the Earth, so they receive more of the Sun’s energy. The satellite then transmits power to the Earth using a laser or microwave beam. Transmission by microwaves has already been tested by NASA, and proven possible. In space, solar irradiance is 144% higher than in the Earth, which means there is a lot more power available up there! Japan has already been working on this idea for 30 years and invested over 20 billion dollars, hoping to finish their project by 2030. The Americans and the Russians are also at the breach, working on a similar idea. The problem with this solution is that we would need to make sure the laser or microwave beam is perfectly orientated toward its receptor on Earth, and would not hit planes or other satellites. Further development is needed before this method is actually feasible.

#### Climate change exacerbates existing water shortages

**WMO 10/5** (World Meteorological Organization, 5-10-2021, "Wake up to the looming water crisis, report warns," World Meteorological Organization, <https://public.wmo.int/en/media/press-release/wake-looming-water-crisis-report-warns>) // VS

Geneva 5 October 2021 - Water-related hazards like floods and droughts are increasing because of climate change. The number of people suffering water stress is expected to soar, exacerbated by population increase and dwindling availability. But management, monitoring, forecasting and early warnings are fragmented and inadequate, whilst global climate finance efforts are insufficient according to a new multi-agency report. The State of Climate Services 2021: Water highlights the need for urgent action to improve cooperative water management, embrace integrated water and climate policies and scale up investment in this precious commodity which underpins all the international goals on sustainable development, climate change adaptation and disaster risk reduction. “Increasing temperatures are resulting in global and regional precipitation changes, leading to shifts in rainfall patterns and agricultural seasons, with a major impact on food security and human health and well-being,” says World Meteorological Organization Secretary-General Prof. Petteri Taalas. “This past year has seen a continuation of extreme, water-related events. Across Asia, extreme rainfall caused massive flooding in Japan, China, Indonesia, Nepal, Pakistan and India. Millions of people were displaced, and hundreds were killed. But it is not just in the developing world that flooding has led to major disruption. Catastrophic flooding in Europe led to hundreds of deaths and widespread damage,” he said. “Lack of water continues to be a major cause of concern for many nations, especially in Africa. More than two billion people live in water-stressed countries and suffer lack of access to safe drinking water and sanitation,” he told the official high-level launch event. “We need to wake up to the looming water crisis,” said Prof. Taalas. The report was coordinated by WMO and contains input from more than 20 international organizations, development agencies and scientific institutions. It is accompanied by a Story Map. Water-related hazards and stress Terrestrial Water Storage (TWS) trends of the past 20 years (2002-2021) According to figures cited in the report, 3.6 billion people had inadequate access to water at least one month per year in 2018. By 2050, this is expected to rise to more than five billion. In the past 20 years, terrestrial water storage – the summation of all water on the land surface and in the subsurface, including soil moisture, snow and ice – has dropped at a rate of 1cm per year. The biggest losses are occurring in Antarctica and Greenland, but many highly populated lower latitude locations are experiencing significant water losses in areas that are traditionally providing water supply, with major ramifications for water security. The situation is worsening by the fact that only 0.5% of water on Earth is useable and available freshwater. Water-related hazards have increased in frequency over the past 20 years. Since 2000, flood-related disasters have risen by 134% compared with the two previous decades. Most of the flood-related deaths and economic losses were recorded in Asia, where end-to-end warning systems for riverine floods require strengthening. The number and duration of droughts also increased by 29% over this same period. Most drought-related deaths occurred in Africa, indicating a need for stronger end-to-end warning systems for drought in that region.

#### Climate change makes water shortages inevitable – that causes hydro-political conflict escalation which goes nuclear

Harvey 8/17 [(Fiona, the Guardian's environment correspondent, won the Foreign Press Association award for Environment Story of the Year and the British Environment and Media Awards journalist of the year) “Global water crisis will intensify with climate breakdown, says report,” The Guardian, 8/17/2021] JL

Mark’s words should be a call to attention, and a call to action. The plight of farmers in Australia illustrates a larger reality: As planetary temperatures continue to increase and rainfall patterns shift due to human-caused climate disruption, our ability to grow crops and have enough drinking water will become increasingly challenged, and the outlook is only going to worsen.

The most recent United Nations Intergovernmental Panel on Climate Change report warned of increasingly intense droughts and mass water shortages around large swaths of the globe.

But even more conservative organizations have been sounding the alarm. “Water insecurity could multiply the risk of conflict,” warns one of the World Bank’s reports on the issue. “Food price spikes caused by droughts can inflame latent conflicts and drive migration. Where economic growth is impacted by rainfall, episodes of droughts and floods have generated waves of migration and spikes in violence within countries.”

Meanwhile, a study published in the journal Global Environmental Change, looked at how “hydro-political issues” — including tensions and potential conflicts — could play out in countries expected to experience water shortages coupled with high populations and pre-existing geopolitical tensions.

The study warned that these factors could combine to increase the likelihood of water-related tensions — potentially escalating into armed conflict in cross-boundary river basins in places around the world by 74.9 to 95 percent. This means that in some places conflict is practically guaranteed.

These areas include regions situated around primary rivers in Asia and North Africa. Noted rivers include the Tigris and Euphrates, the Indus, the Nile, and the Ganges-Brahmaputra.

Consider the fact that 11 countries share the Nile River basin: Egypt, Burundi, Kenya, Eritrea, Ethiopia, Uganda, Rwanda, Sudan, South Sudan, Tanzania and the Democratic Republic of Congo. All told, more than 300 million people already live in these countries, — a number that is projected to double in the coming decades, while the amount of available water will continue to shrink due to climate change.

For those in the US thinking these potential conflicts will only occur in distant lands — think again. The study also warned of a very high chance of these “hydro-political interactions” in portions of the southwestern US and northern Mexico, around the Colorado River.

Potential tensions are particularly worrisome in India and Pakistan, which are already rivals when it comes to water resources. For now, these two countries have an agreement, albeit a strained one, over the Indus River and the sharing of its water, by way of the 1960 Indus Water Treaty.

However, water claims have been central to their ongoing, burning dispute over the Kashmir region, a flashpoint area there for more than 60 years and counting.

The aforementioned treaty is now more strained than ever, as Pakistan accuses India of limiting its water supply and violating the treaty by placing dams over various rivers that flow from Kashmir into Pakistan.

In fact, a 2018 report from the International Monetary Fund ranked Pakistan third among countries facing severe water shortages. This is largely due to the rapid melting of glaciers in the Himalaya that are the source of much of the water for the Indus.

To provide an idea of how quickly water resources are diminishing in both countries, statistics from Pakistan’s Islamabad Chamber of Commerce and Industry from 2018 show that water availability (per capita in cubic meters per year) shrank from 5,260 in 1951, to 940 in 2015, and are projected to shrink to 860 by just 2025.

In India, the crisis is hardly better. According to that country’s Ministry of Statistics (2016) and the Indian Ministry of Water Resources (2010), the per capita available water in cubic meters per year was 5,177 in 1951, and 1,474 in 2015, and is projected to shrink to 1,341 in 2025.

Both of these countries are nuclear powers. Given the dire projections of water availability as climate change progresses, nightmare scenarios of water wars that could spark nuclear exchanges are now becoming possible.