# 1AC

#### I affirm Resolved: The appropriation of outer space by private entities is unjust.

## Framework

**I value morality as ought implies a moral obligation**

**The standard is minimizing material and structural violence. Prefer:**

**Structural violence is built into the system we live in, only through acknowledging and thinking inclusionary can we begin to dismantle it**

**The structural violence of inequality outweighs other impacts—there is an ethical obligation to address it.**

**Ansell 17** — David A. Ansell, Senior Vice President, Associate Provost for Community Health Equity, and Michael E. Kelly Professor of Medicine at Rush University Medical Center (Chicago), holds an M.D. from the State University of New York Upstate Medical University College of Medicine, 2017 (“American Roulette,” *The Death Gap: How Inequality Kills*, Published by the University of Chicago Press, ISBN 9780226428291, p. kindle 307-363)//Ak//recut

There are many different kinds of violence. Some are obvious: punches, attacks, gunshots, explosions. These are the kinds of interpersonal violence that we tend to hear about in the news. Other kinds of violence are intimate and emotional. But the **deadliest** and most thoroughgoing kind of violence is woven into the fabric of American society. It exists when some groups have more access to goods, resources, and opportunities than other groups, including health and life itself. This violence delivers **specific blows against particular bodies in particular neighborhoods**. This unequal advantage and violence is built into the very rules that govern our society. In the absence of this violence, **large numbers of Americans would be able to live fuller and longer lives**. This kind of violence is called structural violence, because it is embedded in the very laws, policies, and rules that govern day-to-day life.8 It is the cumulative impact of laws and social and economic policies and practices that render some Americans less able to access resources and opportunities than others. This inequity of advantage is not a result of the individual’s personal abilities but is built into the systems that govern society. Often it is a product of **racism**, **gender**, and **income inequality**. The diseases and premature mortality that Windora and many of my patients experienced were, in the words of Dr. Paul Farmer, “biological reflections of social fault lines.”9 As a result of these fault lines, a disproportional burden of illness, suffering, and premature mortality falls on certain neighborhoods, like Windora’s. Structural violence can overwhelm an individual’s ability to live a free, unfettered, healthy life. As I ran to evaluate Windora, I knew that her stroke was caused in part by lifelong exposure to suffering, racism, and economic deprivation. Worse, the poverty of West Humboldt Park that contributed to her illness is directly and inextricably related to the massive concentration of wealth and power in other neighborhoods just miles away in Chicago’s Gold Coast and suburbs. That concentration of wealth could not have occurred without laws, policies, and practices that favored some at the expense of others. Those laws, policies, and practices could not have been passed or enforced if access to political and economic power had not been concentrated in the hands of a few. Yet these political and economic structures have become so firmly entrenched (in habits, social relations, economic arrangements, institutional practices, law, and policy) that they have become part of the matrix of American society. The rules that govern day-to-day life were written to benefit a small elite at the expense of people like Windora and her family. These rules and structures are powerful destructive forces. The same structuresthat render life predictable, secure, comfortable, and pleasant for many destroy the lives of others like Windora through **suffering**, **poverty**, **ill health**, and **violence**. These structures are neither natural nor neutral. The results of structural violence can be very specific. In Windora’s case, stroke precursors like chronic stress, poverty, and uncontrolled hypertension run rampant in neighborhoods like hers. Windora’s illness was caused by neither her cultural traits nor the failure of her will. Her stroke was caused in part by inequity. She is one of the lucky ones, though, because even while structural violence ravages her neighborhood, it also abets the concentration of expensive stroke- intervention services in certain wealthy teaching hospitals like mine. If I can get to her in time, we can still help her. Income Inequality and Life Inequality Of course, Windora is not the only person struggling on account of structural violence. Countless neighborhoods nationwide are suffering from it, and people are dying **needlessly young** as a result. The magnitude of this excess mortality is mind-boggling. In 2009 my friend Dr. Steve Whitman asked a simple question, “How many extra black people died in Chicago each year, just because they do not have the same health outcomes as white Chicagoans?” When the Chicago Sun-Times got wind of his results, it ran them on the front page in bold white letters on a black background: “HEALTH CARE GAP KILLS 3200 Black Chicagoans and the Gap is Growing.” The paper styled the headline to look like the declaration of war that it should have been. In fact, we did find ourselves at warnot long ago, when almost 3,000 Americans were killed. That was September 11, 2001. That tragedy propelled the country to war. Yet when it comes to the premature deaths of urban Americans, no disaster area has been declared. No federal troops have been called up. No acts of Congress have been passed. Yet this disaster is **even worse**: those 3,200 black people were in Chicago alone, in just one year. Nationwide each year, more than **60,000** black people die prematurely because of inequality.10 While blacks suffer the most from this, it is not just an issue of racism, though racism has been a unique and powerful transmitter of violence in America for over four hundred years.11 Beyond racism, poverty and income inequality perpetuated by exploitative market capitalism are singular agents of transmission of **disease and early death**. As a result, there is a new and alarming pattern of declining life expectancy among white Americans as well. Deaths from drug overdoses in young white Americans ages 25 to 34 have exploded to levels not seen since the AIDS epidemic. This generation is the first since the Vietnam War era to experience higher death rates than the prior generation.12 White Americans ages 45 to 54 have experienced skyrocketing premature death rates as well, something not seen in any other developed nation.13 White men in some Appalachian towns live on average twenty years less than white men a half-day’s drive away in the suburbs of Washington, DC. Men in McDowell County, West Virginia, can look forward to a life expectancy only slightly better than that of Haitians.14 But those statistics reflect averages, and every death from structural violence is **a person**. When these illnesses and deaths are occurring one at a time in neighborhoods that society has decided not to care about—neighborhoods populated by poor, black, or brown people—they seem easy to overlook, especially if you are among the fortunate few who are doing incredibly well. The tide of prosperity in America has lifted some boats while others have swamped. Paul Farmer, the physician-anthropologist who founded Partners in Health, an international human rights agency, reflects on the juxtaposition of “unprecedented bounty and untold penury”: “It stands to reason that as beneficiaries of growing inequality, we do not like to be reminded of misery of squalor and failure. Our popular culture provides us with no shortage of anesthesia.”15 That people suffer and die prematurely because of inequality is **wrong**. It is wrong from an **ethical** perspective. It is wrong from a **fairness** perspective. And it is wrong because **we have the means to fix it**.

**Prefer Structural violence because any impact calculus focused framework leaves marginalized people behind**

Nicole Akoukou **Thompson 18**. Chicago-based creative writer. 4-6-2018. "Why I will not allow the fear of a nuclear attack to be white-washed." RaceBaitR. http://racebaitr.com/2018/04/06/2087/Ak //recut

I couldn’t spare empathy for a white woman whose biggest fear was something that hadn’t happened yet and might not. Meanwhile, **my** most significant fears were **in motion**: women and men **dying in cells** after being wrongly imprisoned, **choked out** for peddling cigarettes, or **shot to death** during ‘routine’ traffic stops. I twitch when my partner is late, worried that a cantankerous cop has brutalized or shot him because he wouldn’t prostrate himself. As a woman of color, I am aware of the multiple types of violence that threatenme **currently—not theoretically**. **Street harassment**, excessively affecting me as a Black woman, has blindsided me since I was eleven. A premature body meant being **catcalled** before I’d discussed the birds and the bees. It meant being **followed**, **whistled at**, or **groped**. As an adult, while navigating through neighborhoods with extinguished street lights, I noticed the correlation between women’s safety and street lighting—as well as the fact that Black and brown neighborhoods were never as brightly lit as those with a more significant white population. I move quickly through those unlit spaces, never comforted by the inevitable whirl of red and blue sirens. In fact, it’s always been the contrary. Ever so often, cops approach me in their vehicle’s encouraging me to “Hurry along,” “Stay on the sidewalk,” or “Have a good night.” My spine stiffening, I never believed they endorsed my safety. Instead, I worried that I’d be accused of an unnamed accusation, corned by a cop who preys on Black women, or worse. A majority of my 50-minute bus ride from the southside of Chicago to the north to join these women for the birthday celebration was spent reading articles about citywide shootings. I began with a Chicago Tribute piece titled “33 people shot, seven fatally, in 13 hours,” then toppled into a barrage of RIP posts on Facebook and ended with angry posts about police brutality on Tumblr. You might guess, by the time I arrived to dinner I wasn’t in the mood for the “I can’t believe we’re all going to die because Trump is an idiot” shit. I shook my head, willing the meal to be over, and was grateful when the check arrived just as someone was asking me about my hair. My thinking wasn’t all too different from Michael Harriot’s ‘Why Black America Isn’t Worried About the Upcoming Nuclear Holocaust.” While the meal was partly pleasant, I departed thinking, “fear of nuclear demolition is **just some white shit**.” Sadly, that thought would not last long. I still vibe with Harriot’s statement, “Black people have lived under the specter of having our existence erased on a white man’s whim since we stepped onto the shore at Jamestown Landing.” However, a friend—a Black friend—ignited my nuclear paranoia by sharing theories about when it might happen and who faced the greatest threat. In an attempt to ease my friend’s fear, I leaned in to listen but accidentally toppled down the rabbit hole too. I forked through curated news feeds. I sifted through “fake news,” “actual news,” and foreign news sources. Suddenly, an idea took root: nuclear strike would **disproportionately impact Black people**, **brown people**, and **low-income individuals**. North Korea won’t target the plain sight racists of **Portland**, Oregon, the violently microaggressive **liberals** of the **rural Northwest**, or the white-hooded **klansmen** of Diamondhead, **Mississippi**. No, under the instruction of the supreme leader Kim Jong-un, North Korea will likely strike **densely populated urban areas**, such as Los Angeles, Chicago, Washington D.C., and New York City. These locations stand-out as targets for a nuclear strike because they are **densely populated** U.S. population centers. Attacking the heart of the nation or populous cities would translate to more casualties. With that in mind, it’s not lost on me that the most populous cities in the United States boast sizeable diverse populations, or more plainly put: **Black populations**. This shit stresses me out! There’s a creeping chill that follows me, a silent alarm that rings each time my Google alert chimes letting me know that Donald Trump has yet again provoked Kim Jong-Un, a man who allegedly killed his very own uncle. I’ve grown so pressed by the idea of nuclear holocaust that my partner and I started gathering non-perishables, candlesticks, a hand-crank radio, and other must-buy items that can be banked in a shopping cart. The practice of preparing for a nuclear holocaust **sometimes feels comical**, particularly when acknowledging that there has long been a war on Black people in this country. Blackness is bittersweet in flavor. We are blessed with the melanized skin, the MacGyver-like inventiveness of our foremothers, and our blinding brightness—but the anti-blackness that we experience is also blinding as well as stifling. We are stuck by rigged systems, punished with the prison industrial complex, housing discrimination, pay discrimination, and worse. We get side-eyes from strangers when we’re “loitering,” and the police will pull us over for driving “too fast” in a residential neighborhood. We get murdered for holding cell phones while standing in our grandmother’s backyard. The racism that strung up our ancestors, kept them sequestered to the back of the bus and kept them in separate and unequal schools still lives. It lives, and it’s more palpable than dormant. To me, this means one thing: Trump’s America isn’t an unfortunate circumstance, it’s a homecoming event that’s hundreds of years in the making, no matter how many times my white friends’ say, “He’s not my president.” In **light** of this homecoming, we now flirt with a **new, larger fear of a Black genocide**. America has always worked towards Black eradication through a **steady stream of life-threatening inequality**, but **nuclear war on American soil would be swift**. And for this reason I’ve grown **tired** of **whiteness** being at the **center of the nuclear conversation**. The **race-neutral approach to the dialogue**, and a tendency to continue to promote the idea that missiles will land in **suburban** and **rural backyards**, instead of inner-city playgrounds, is **false**. “The Day After,” the iconic, highest-rated television film in history, aired November 20, 1983. More than 100 million people tuned in to watch a film postulating a war between the Soviet Union and the United States. The film, which would go on to affect President Ronald Reagan and policymakers’ nuclear intentions, shows the “true effects of nuclear war on average American citizens.” The Soviet-targeted areas featured in the film include Higginsville, Kansas City, Sedalia, Missouri, as well as El Dorado Springs, Missouri. They depict the destruction of the central United States, and viewers watch as full-scale nuclear war transforms middle America into a burned wasteland. Yet unsurprisingly, the devastation from the attack is **completely white-washed**, leaving out the **more likely victims** which are the **more densely populated (Black) areas**. Death tolls would be high for white populations, yes, but large-scale losses of Black and brown folks would **outpace that number**, due to **placement** and **poverty**. That number would be pushed higher by limited access to premium **health care**, **wealth**, and **resources**. The effects of radiation sickness, burns, compounded injuries, and malnutrition would throttle Black and brown communities and would **mark us for generations**. It’s for **that reason** that we have to do more to foster disaster preparedness among Black people where we can. Black people **deserve the space** to **explore nuclear unease**, **even if we have competing threats, anxieties, and worries**. Jacqui Patterson, Director of the Environmental and Climate Justice Initiative, once stated: African American communities are disproportionately vulnerable to and impacted by natural (and unnatural) catastrophes. Our socio-economic vulnerability is based on multiple factors including our lack of wealth to cushion us, our disproportionate representation in lower quality housing stock, and our relative lack of mobility, etc

## C1 – private sector bad

#### Space exploration intrinsically cannot be private sector - they lack the monetary incentive to put human life first

Phillips 20 [(Leigh, science writer and EU affairs journalist, and science writer for the Pacific Institute for Climate Solutions at the University of Victoria.) “We Don’t Need Elon Musk to Explore the Solar System,” May 8, 2021, https://jacobinmag.com/2021/05/elon-musk-space-exploration-mars-colonization//Ak /

He opens the paper with a recognition that, at some point, if we stay on Earth, we will confront an eventual extinction event. “The alternative is to become a spacefaring civilization and a multi-planetary species.” He alights upon Mars as the obvious first option for establishing a “self-sustaining city — a city that is not merely an outpost, but which can become a planet in its own right.” He rejects Venus due to it being, as he correctly puts it, a super-high-pressure, hot acid bath. He rejects Mercury due to it being too close to the Sun, and the Moon for lack of atmosphere and its twenty-eight-day “day” (a Martian day, or “sol,” for comparison, is an Earthling-friendly 24.5 hours). And he rejects, at least for now, the moons of Jupiter or Saturn, as they are much harder to get to. Mars has more than its own share of habitability issues, but Musk does not mention them, other than to say that, while Mars is “a little cold” (in reality, -63ºC, or -81ºF, compared to Earth’s balmy 16ºC, or 57ºF), “we can warm it up.” The Martian atmosphere is “very helpful” because it’s primarily CO2, with some nitrogen and argon, meaning that “we can grow plants on Mars just by compressing the atmosphere.” Most cheery of all, Musk says it would be “quite fun” to be on Mars, because the gravity is about 38 percent that of Earth, making it easy to lift heavy things and “bound around.” Mars, as seen from space. (WikiImages via Pixabay) It’s all so simple. “We just need to change the populations because currently we have seven billion people on Earth and none on Mars.” And so the paper is primarily devoted to explaining how to solve that sole problem: how to lower the cost of a trip to Mars from the current roughly $10 billion per person down to the median cost of a house in the United States. By making rockets reusable, refilling in orbit, producing propellant on Mars, choosing the right propellant, and improving system design and performance, Musk reckons he can get the cost of a ticket down to $200,000, perhaps as little as $100,000. And Musk’s SpaceX has done a tremendous job so far of sharply reducing the cost of escaping Earth’s gravity well, primarily via deep vertical integration of the firm. It produces a whopping 70 percent of its components in-house, as opposed to the 1,200 different suppliers in the outsourced supply chain of its main competitor, the Boeing–Lockheed Martin partnership known as the United Space Alliance. Each of these suppliers extracts their own profit margin from every contract in the chain, jacking up the cost per launch to $460 million. SpaceX, by comparison, charges NASA and its other clients just $62 million per launch, and Musk says he has slashed the marginal cost of a reused Falcon 9 booster launch to a mere $15 million. Well done, Elon. Or, rather, well done to all the engineers, logistical experts, and other workers who have done most of the labor, allowing SpaceX to revolutionize the business model of getting to space. There is not really any mention of the enormous challenges of the atmosphere’s low pressure and toxic composition, the preponderance of deadly perchlorates in the soil, or the lack of magnetosphere to protect against solar and cosmic radiation. The current atmosphere of Mars is too thin to support most life: its pressure is only about 1 percent that of Earth. Only hypopiezotolerant microbes (those that live in low-pressure environments), such as ones that are lofted by winds into Earth’s stratosphere, would be able to survive. The atmosphere is also 95 percent carbon dioxide — fine for plants (if the pressure were able to be raised) but not for animals. Musk does say that once Mars is warmed up, “we would once again have a thick atmosphere and liquid oceans.” Bioremediation using bacteria to clean up perchlorates already occurs on Earth, but we are talking about an entire planet here. There is no discussion of how any of this might happen, over what time period, and who would pay for it. Same with the construction of an artificial magnetosphere. Dealing with the perchlorates alone would likely be profoundly more challenging and expensive than the relatively straightforward process of decarbonizing Earth’s economy. A 2018 NASA study found that there is insufficient CO2 and H2O from the Martian soil, polar ice caps, and minerals in the upper crust to get anywhere close to thickening the atmosphere and using it like a blanket to warm up the planet. All these sources combined would still only boost the pressure to about 7 percent of that of Earth. Carbon-bearing minerals deep in the crust might have enough CO2 to achieve the needed pressure, but nothing is known about their extent, and recovering them with current technology would be colossally energy intensive. Another idea is to direct comets or asteroids to crash into Mars and release their greenhouse gases that way. Again, these are fantastical ideas that will be impractical for many, many generations yet to come. NASA astronauts in space. (NASA) And there is likely no way of ever overcoming Mars’s low gravity. If you added all the mass of Venus to that of Mars, smashing the planets together, even then, you would still not quite achieve Earth’s gravity. It is true that we do not know what the physiological effects of 38 percent of Earth’s gravity are, either on humans or other life. We have two data points: Earth gravity, what we call 1G, and the 0G microgravity of the International Space Station (ISS). But from studies of astronauts who have spent extended periods aboard the ISS, we know that 0G is extremely bad for human health. Muscles atrophy. Tendons and ligaments begin to fail. Facial and finger muscles, which cannot be worked out via onboard gyms or treadmills, weaken. The spine lengthens, with astronauts gaining an inch or two in height and suffering from back pain. Bones demineralize, losing density at a rate of 1 percent per month. As Christopher Wanjek, a former NASA science writer and author of 2020 book Spacefarers — which is an optimistic volume on the viability of manned space travel — notes: “To visualize how bad that bone loss is, consider the fact that the major obstacle to fully recycling urine into drinking water on the ISS is that the filters get clogged daily with calcium deposits.” Wanjek writes how the rate of vision loss is such that a crew to Mars would need to pack eyeglasses with various prescriptions for “each phase of their gradual, inevitable, and permanent vision loss.” Kidneys get confused by blood not being where it’s supposed to be and think there is an excess, so they start to remove what they believe to be excess water. The blood thickens, driving a reduced production of red blood cells, which in turn drives anemia, shortness of breath, lethargy, and greater likelihood of infection. Perhaps worst of all, brain compression resulting from microgravity negatively impacts regions responsible for fine motor movement and executive function — deteriorations that could be permanent. A range of interventions, including exercise, drugs, and compression clothing can shave the sharp edges off some of these effects, but ultimately, the solution on a spacecraft is the simulation of gravity via centrifugal force — a spinning ship. This is not something that you can do with a whole planet. It is for this reason that Venus, with its gravity not too far off that of Earth, may actually be a better terraforming candidate than Mars — one day — despite its currently inhospitable atmosphere. The Real Business of SpaceX Isn’t Mars One has to suspect that Musk knows all this. We have a hint of this when, at one point in his paper, Musk concedes that it will be difficult to fund his vision just by slashing the cost of getting to space. He admits that SpaceX expects to generate substantial cash flow from launching lots of satellites and servicing the International Space Station for NASA. Additional help for bankrolling the Mars project might come from the emergence of a market for really fast transportation of things or people around the world by rocket: cargo could be transported anywhere on Earth in forty-five minutes, and a trip from New York to Tokyo could take a mere twenty-five minutes (so long as takeoff and landing takes place where the tremendous noise, as he puts it in hip-CEO-speak, “is not a super-big deal”). As a result, one gets the impression by reading between the lines that a self-sustaining Martian city is all just an impressive marketing maneuver taking advantage of most people’s sense of adventure and wonder; of our species’ ancient need to wander and explore. The real business of SpaceX was never a Martian colony but rather servicing a mature satellite market, stealing government space contracts from the likes of Boeing, and kicking off a terrestrial rocket transport sector. The dream of Mars is, in this case, not really any different from the adman’s fiction of romance and aspiration that sells a can of Pepsi or a Jeep. The dream of Mars is, in this case, not really any different from the adman’s fiction of romance and aspiration that sells a can of Pepsi or a Jeep. None of this is to suggest that establishing an outpost on Mars for the purposes of scientific exploration should not be attempted, even in the next couple of decades. But an outpost, as Musk himself makes clear, does not approach a self-sustaining city, and still less a multi-planetary species. Because humans do need to exit Earth at some point in order to maintain the species, if we are to establish genuinely self-sustaining colonies, then terraforming will likely be necessary one day, as well as interstellar generation ships that take us to habitable exoplanets far beyond the solar system. For all of this, we will have to figure out how to take our ecology with us. We are not really the collection of individuals we thought we were, but rather are deeply embedded within our ecosystems. Indeed, each of us is a microbial ecosystem whose edges are vague. Where does the bacterial, fungal, and viral multitude that is “me” stop and my equally microbiological environment begin? This does not mean that Earth will be the only home we ever have, but it does mean that the antiseptic, forestless, riverless Starship Enterprise would leave its inhabitants very sick before too long. How much of our ecology do we need to take with us, though? We just don’t know yet. The science of ecology is very much still a young discipline. This is where fantastical science-fiction conceptions of vast ships made from hollowed out asteroids and packed with different biomes fills the gap of what we do not know. Likewise for novels like Becky Chambers’s To be Taught, if Fortunate, in which, instead of terraforming other worlds, adapting them to our needs, we genetically alter our bodies via “somaforming” to adapt ourselves to their conditions. Plainly, then, there is no rush for any of this, even as there is a moral imperative for us, one day in the distant future, to permanently exit Earth. Our colonization of other worlds is akin to the building of the grandest cathedral we have ever envisaged: a project that will take centuries, or more likely millennia, many millennia. This is nothing that a private company can deliver. There is no near-term return on investment; indeed, there is no aim of profitability at all, but rather of our species’ survival through the eons.

#### **Private companies launching satellites legal in the US – can spread globally**

Matt Williams,(reporter) 12-11-2017, "Trump signs an executive order allowing mining the moon and asteroids," No Publication, https://phys.org/news/2020-04-trump-moon-asteroids.html//ak//

In 2015, the Obama administration signed the U.S. Commercial Space Launch Competitiveness Act (CSLCA, or H.R. 2262) into law. This bill was intended to "facilitate a pro-growth environment for the developing commercial space industry" by making it legal for American companies and citizens to own and sell resources that they extract from asteroids and off-world locations (like the moon, Mars or beyond).¶ On April 6th, the Trump administration took things a step further by signing an executive order that formally recognizes the rights of private interests to claim resources in space. This order, titled "Encouraging International Support for the Recovery and Use of Space Resources," effectively ends the decades-long debate that began with the signing of the Outer Space Treaty in 1967.¶ This order builds on both the CSLCA and Space Directive-1 (SD-1), which the Trump administration signed into law on December 11th, 2017. It establishes that "Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space, consistent with applicable law," and that the United States does not view space as a "global commons."¶ The Outer Space Treaty¶ This order puts an end to decades of ambiguity regarding commercial activities in space, which were technically not addressed by the Outer Space or Moon treaties. The former, formally known as "The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies", was signed by the U.S., the Soviet Union, and the U.K. in 1967 at the height of the Space Race.¶ Apollo 11’s Saturn V rocket prior to the launch July 16, 1969. Screenshot from the 1970 documentary “Moonwalk One.” Credit: NASA/Theo Kamecke/YouTube¶ The purpose of it was to provide a common framework governing the activities of all the major powers in space. In addition to banning the placement or testing of nuclear weapons in space, the Outer Space Treaty established that the exploration and use of outer space would be carried out for the benefit "of all mankind."¶ As of June 2019, the treaty has been signed by no less than 109 countries, while another 23 have signed it but have not yet completed the ratification process. At the same time, there has been an ongoing debate regarding the full meaning and implications of the treaty. Specifically, Article II of the treaty states: "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."¶ As the language is specific to national ownership, there has never been a legal consensus on whether or not the treaty's prohibitions apply to private appropriation, as well. Because of this, there are those who argue that property rights should be recognized on the basis of jurisdiction rather than territorial sovereignty.¶ The Moon Treaty¶ Artist’s illustration of the new spacesuit NASA is designing for Artemis astronauts. It’s called the xEMU,, or Exploration Extravehicular Mobility Unit. Credit: NASA¶ Attempts to address this ambiguity led the United Nations to draft the supplemental "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" aka "The Moon Treaty" or "Moon Agreement." Like the Outer Space Treaty, this agreement stipulated that the moon should be used for the benefit of all humanity and that non-scientific activities should be governed by an international framework.¶ However, to date, only 18 countries have ratified the Moon Treaty, which does not include the U.S., Russia, or any other major power in space (save for India). In addition, only 17 of the 95 member states who signed the Outer Space Treaty have become signatories on the Moon Treaty. This latest order, titled "Executive Order on Encouraging International Support for the Recovery and Use of Space Resources," addresses this very issue, stating:¶ "Uncertainty regarding the right to recover and use space resources, including the extension of the right to commercial recovery and use of lunar resources, however, has discouraged some commercial entities from participating in this enterprise. Questions as to whether the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the "Moon Agreement") establishes the legal framework for nation states concerning the recovery and use of space resources have deepened this uncertainty, particularly because the United States has neither signed nor ratified the Moon Agreement."¶ The administration considers this act to be complimentary to SD-1, which emphasizes the importance of commercial partners in Project Artemis and NASA's plan to explore Mars and beyond. "Successful long-term exploration and scientific discovery of the moon, Mars, and other celestial bodies will require partnership with commercial entities to recover and use resources, including water and certain minerals, in outer space," the directive states.¶ Return to the moon¶ Infographic of the evolution of lunar activities on the surface and in orbit. Credit: NASA¶ After Artemis III accomplishes the long-awaited goal of sending the first astronauts to the moon since the end of the Apollo era, NASA's plans will shift toward the long-term aim of creating a "sustainable program" of lunar exploration. This will include the creation of the Lunar Gateway (an orbital habitat) as well as the Lunar Base Camp on the surface of the moon.¶ These two habitats and research stations will allow for long-term stays on the moon, a wide array of scientific experiments, and even the ability to conduct on-site refueling. Combined with a reusable lunar lander, lunar rovers and other non-expendable elements, they will also facilitate regular missions to the moon and an overall reduction in costs.¶ For years, prospectors and space mining companies like Planetary Resources and Deep Space Industries have been advocating for reforms that would allow for the commercial exploitation of space. Similarly, people like Peter Diamandis (founder of X Prize and HeroX) and science communicator Neil DeGrasse Tyson have been saying for years that the first trillionaires will make their fortunes from asteroid mining.¶ Incidentally, NASA and HeroX recently launched the "Honey, I Shrunk the NASA Payload" challenge, which is offering $160,000 to the team that can come up with a solution to miniaturize payloads to the point where they are "similar in size to a new bar of soap"—100 x 100 x 50 mm (3.9 x 3.9 x 1.9 inches) and weighing no more than 0.4 kg (0.8 lbs).¶ The purpose of this challenge is to significantly reduce the cost of sending payloads to the moon in support of future lunar missions. However, it could also enable a new generation of mini-rovers that would explore the lunar surface for resources. As the hosts indicate on the challenge site:¶ The JPL-led challenge is seeking tiny payloads no larger than a bar of soap for a miniaturized Moon rover. Credit: NASA¶ "We need to develop practical and affordable ways to identify and use lunar resources so that our astronaut crews can become more independent of Earth… Imagine a rover the size of your Roomba crawling the moon's surface. These small rovers developed by NASA and commercial partners provide greater mission flexibility and allow NASA to collect key information about the lunar surface."¶ It is not hard to imagine at all that miniature rover's would also enable commercial entities the ability to explore asteroids and the lunar surface for resources that could be harvested and processed for export back to Earth. However, not everyone is so excited by this recent move or the prospects that it entails.¶ Dissenting Views¶ In fact, Russia's space agency (Roscosmos) officially condemned the executive order and likened it to colonialism. These sentiments were summed up in a statement issued by Sergey Saveliev, Roscosmos' deputy director-general on international cooperation:¶ "Attempts to expropriate outer space and aggressive plans to actually seize territories of other planets hardly set the countries (on course for) fruitful cooperation. There have already been examples in history when one country decided to start seizing territories in its interest—everyone remembers what came of it."¶ Artist’s impression of a lunar base. Credit: Newspace2060¶ Saveliev is hardly alone in drawing parallels between the NewSpace industry (or Space Race 2.0) and the age of imperialism (ca. 18th to 20th century). Last year, Dr. Victor Shammas of the Work Research Institute at Oslo Metropolitan University and independent scholar Tomas Holen produced a study that appeared in Palgrave Communications (a publication maintained by the journal Nature).¶ Titled, "One giant leap for capitalist kind: private enterprise in outer space," Shammas and Holen assert that the commercial exploitation of space will benefit human beings disproportionately. At the heart of this effort are Elon Musk, Jeff Bezos, and other Silicon Valley-billionaires that—contrary to their humanist pretenses—are looking to expand their wealth while taking advantage of the fact that there is little to no oversight in this area.¶ "In this regard," they wrote, "SpaceX and related ventures are not so very different from maritime colonialists and the trader-exploiters of the British East India Company." For the record, the East India Company operated with impunity in India while it was under British rule, effectively making them the real governing authority over the nation and its people.¶ Credit: NASA/JPL/911Metallurgist/NeoMam Studios¶ Could asteroid mining, lunar mining, and other off-world concerns become the new colonialism? Could various companies staking claims to bodies, planets, and moons set off a period of conflict and cutthroat politics similar to what existed during the 18th to early 20th centuries? Or could this be the beginning of "post-scarcity" for humanity and an economic revolution?¶ And is this condemnation by Russian authorities merely an expression of lament because they don't feel well-positioned to take advantage and will that change if the Russian equivalent of a Musk or Bezos emerges? And what might we expect from countries like China and India that have been making significant strides in space for years?¶ All valid questions, and one which will have to be explored with greater energy and commitment now that the U.S. has officially declared that the moon and space are "open for business." It also wouldn't be surprising if certain charlatans try to push the whole "buy land on the moon" scam with greater vigor, too.

**Increasing number of satellites from private companies like SpaceX increase the quantity of dangerous space debris**

**Scheer and Moss 20** [(Roddy Scheer and Doug Moss, ) “The Good, The Bad &amp; The Ugly: Satellites &amp; The Environment,” Emagazine https://www.newsbreak.com/news/2178042533743/the-good-the-bad-the-ugly-satellites-the-environment, 8-13-2020//Ak//

Putting satellites up into the ionosphere—the layer of our atmosphere extending from 50-600 miles above the surface where a high concentration of ions and free electrons facilitate the reflection of radio waves—isn’t anything new. The Soviets beat us to the punch when they launched the first satellite, Sputnik, in 1957, but these days there are over 9,000 satellites overhead, the majority from U.S. companies and government agencies. But with Elon Musk’s SpaceX poised to launch tens of thousands of new ones in the next few years, many people wonder whether putting all this technology overhead is such a good idea. One concern is that all this hardware eventually breaks down and shed parts. Peter Greenstreet of the Institute of Physics reports that this so-called “space junk” orbits at some 7.5 kilometers per second—so fast that even the tiniest pieces create a potential hazard for space stations and other man-made or natural objects making the same rounds.

**Debris is bad, Kessler syndrome, satellite destruction prove - expected private sector satellites is the tipping point**

**Thompson 20** [(Clive, author of Coders: The Making of a New Tribe and the Remaking of the World, a columnist for Wired magazine, and a contributing writer to The New York Times Magazine) “Monetizing the Final Frontier The strange new push for space privatization,” December 3, 2020 <https://newrepublic.com/article/160303/monetizing-final-frontier>//ak //

“Physics tells us that two things can’t occupy the same space at the same time or else bad things happen,” Jah said dryly. Indeed, there’s already been one collision that produced sprawling orbital pollution. In 2009, a satellite owned by the U.S. firm Iridium slammed into a decommissioned Russian government satellite at more than 26,000 mph. The crash produced 2,300 pieces of debris, spraying off in all directions. And debris is a particularly gnarly problem in space, because when it’s traveling at thousands of miles an hour, even a marble-size chunk is like a bullet, capable of rendering a damaged satellite inoperable and unsteerable—the owner can no longer fire its boosters to guide it into a higher or lower orbit. There are currently an estimated 500,000 marble-size chunks up there. Decades of space travel by governments left plenty of refuse, ranging from parts of rocket boosters to stray bits of scientific experiments. One particularly grim vision of the future that haunts astronomers is the “Kessler syndrome,” proposed by the astrophysicist Donald Kessler in 1978. Kessler hypothesized that space clutter could reach a tipping point: One really bad collision could produce so much junk that it would trigger a chain reaction of collisions. This disaster scenario would leave hundreds of satellites eventually destroyed, and create a ring of debris that would make launching any new satellites impossible, forever. “Near space is finite—it’s a finite resource,” Jah said. “So now you have this growing trash problem that isn’t being remediated.... And if we exceed the capacity of the environment to carry all this traffic safely, then it becomes unusable.” That’s why a growing chorus of critics are already making the case that space is the next major environmental area to protect, after the oceans and land on Earth. “People seem to really treat resources in space as being infinite,” said Erika Nesvold, an astrophysicist who’s the cofounder of The JustSpace Alliance. “As we’ve seen, people don’t really intuitively understand exponential growth.” That’s the dilemma in a nutshell: The available room in the sky is limited, but the plans for growth are exponential. SpaceX isn’t the only New Space firm looking to toss up satellites. Satellite and rocket start-ups are now lining up en masse, atop new waves of investment. There are satellites geared up to connect to “the internet of things” so companies can communicate among proprietary networks of household devices. There are floating cameras pointing down—so as to gather “geospatial intelligence,” which is to say data streamed from “the vantage point you get from satellites looking down on Earth and giving us information about our planet,” as the venture capitalist Anderson told me. And new forms of satellite vision are emerging all the time, such as cameras that can see at night, or are specially designed to see agriculture. Experiments abound, and so satellite launches will inevitably multiply in their wake. Part of what makes near-Earth orbit so chaotic is that it is, at the moment, remarkably unregulated—not unlike the internet of the early ’90s. An American firm has to get permission from the Federal Communications Commission to launch a satellite, but once it’s in orbit, there’s no federal agency that can compel it to move out of the path of a collision. Satellite owners generally don’t like to move if they can avoid it, because their satellites have a limited amount of fuel; any movement decreases their usable lifespan. On top of that, there are dozens of nations shooting satellites into low-Earth orbit—but no international body coordinating their flight paths. Last fall, the European Space Agency realized one of SpaceX’s new Starlink satellites was on a dangerously close path to an ESA satellite. SpaceX said it had no plans to move the satellite; so the ESA decided to fire its thrusters and get clear. This high-stakes negotiation was conducted via email. What’s more, space debris is extremely hard to source. If a British satellite slams into yours, you can probably figure out who hit you. But if your satellite is wrecked by a random piece of junk, nobody has any clue where that debris came from. It is, in this way, a neat parallel to the problem of C02, where a ceaseless barrage of tiny commercial decisions creates a sprawling problem—one that’s all but designed to ensure that everyone who caused it can deny responsibility. And damage is asymmetric: A company with a small $60,000 satellite could smash into a wildly expensive one paid for by U.S. taxpayers. “A National Reconnaissance Office satellite is at least a billion dollars, if not more, so they have a lot more to lose if something hits a satellite,” Bhavya Lal, a researcher at the IDA Science and Technology Policy Institute, noted. “As more private activity starts to happen, there’s more chances of that loss of control, too.” One might dismiss all this anxiety as a sort of sci-fi version of hippie environmentalism—except that even the administrator of NASA is deeply worried about the chaos and destruction likely to be sown by commercial activity in near-Earth orbit. Jim Bridenstine, the Trump-appointed head of NASA, is as pro-market as one can be. He praises SpaceX every chance he gets; he talks about privatizing the space station. But when I asked him about the looming danger of space debris, during a press-conference call, he conceded that it’s a huge, unresolved issue.

**Climate oriented satellites key to warming adaptation and prevention especially in developing countries– private sector satellite’s debris thump**

**Alonso 18** [(Elisa Jiménez Alonso, communications consultant with Acclimatise, climate resilience organization) “Earth Observation of Increasing Importance for Climate Change Adaptation,” Acclimatise, May 2, 2018, <https://www.acclimatise.uk.com/2018/05/02/earth-observation-of-increasing-importance-for-climate-change-adaptation/ak//>

Earth observation (EO) satellites are playing an increasingly important role in assessing climate change. By providing a constant and consistent stream of data about the state of the climate, EO is not just improving scientific outcomes but can also inform climate policy.¶ Managing climate-related risks effectively requires accurate, robust, sustained, and wide-ranging climate information. Reliable observational climate data can help scientists test the accuracy of their models and improve the science of attributing certain events to climate change. Information based on projections from models and historic data can help decision makers plan and implement adaptation actions.¶ Providing information in data-sparse regions¶ Ground-based weather and climate monitoring systems only cover about 30% of the Earth’s surface. In many parts of the world such data is incomplete and patchy due to poorly maintained weather stations and a general lack of such facilities.¶ EO satellites and rapidly improving satellite technology, especially data from open access programmes, offer a valuable source information for such **data-sparse regions**. This is especially important since countries and regions with a lack of climate data are often particularly vulnerable to climate change impacts.¶ International efforts for systematic observation¶ The importance of satellite-based observations is also recognised by the international community. Following the recommendations of the World Meteorological Organization’s (WMO) Global Climate Observing System (GCOS) programme, the UNFCCC strongly encourages countries that support space agencies with EO programmes to get involved in GCOS and support the programme’s implementation. The Paris Agreement highlights the need for and importance of effective and progressive responses to the threat of climate change based on the best available scientific knowledge. This implies that climate knowledge needs to be strengthened, which includes continuously improving systematic observations of the Earth’s climate.¶ To meet the need of such systematic climate observations, GCOS developed the concept of the Essential Climate Variable, or ECV. According to WMO, an ECV “is a physical, chemical or biological variable or a group of linked variables that critically contributes to the characterization of Earth’ s climate.” In 2010, 50 ECVs which would help the work of the UNFCCC and IPCC were defined by GCOS. The ECVs, which can be seen below, were identified due to their relevance for characterising the climate system and its changes, the technical feasibility of observing or deriving them on a global scale, and their cost effectiveness.¶ The 50 Essential Climate Variables as defined by GCOS.¶ One effort supporting the systemic observation of the climate is the European Space Agency’s (ESA) Climate Change Initiative (CCI). The programme taps into its own and its member countries’ EO archives that have been established in the last three decades in order to provide a timely and adequate contribution to the ECV databases required by the UNFCCC.¶ Robust evidence supporting climate risk management¶ Earth observation satellites can observe the entire Earth on a daily basis (polar orbiting satellites) or continuously monitor the disk of Earth below them (geostationary satellites) maintaining a constant watch of the entire globe. Sensors can target any point on Earth even the most remote and inhospitable areas which helps monitor deforestation in vast tropical forests and the melting of the ice caps.¶ Without insights offered by EO satellites there would not be enough evidence for decision makers to base their climate policies on, increasing the risk of **maladaptation**. Robust EO data is an invaluable resource for collecting climate information that can inform climate risk management and make it more effective.

#### Space debris disproportionally affects developing countries – climate change and falling debris ravages

Anél **Ferreira-Snyman**, March 20**13**, [Professor of Law, [University of South Africa](https://scholar.google.com/citations?view_op=view_org&hl=en&org=10976511949285581406)],Institute of Foreign and Comparative Law, https://www.jstor.org/stable/pdf/23644687.pdf?refreqid=excelsior%3Aa1967e39b015b325681ae4df0973545c//Ak//

As African states realise the socio-economic and human security benefits of space applications and thus become increasingly involved in space activities, the issue of space debris will inevitably also become a greater concern for these states. The consequences of damage as a result of satellites being involved in accidents with space debris will be especially serious for the developing states which have limited resources.175 There is also a possibility of environmental damage on the territories of the developing states as a result of falling space debris. It is, therefore, imperative that more African states (including states not involved in space activities) become parties to and comply with the space treaties. They should further increase their representation in the UNCOPUOS in order to have stronger bargaining power and influence in this Committee, by presenting a united African position on space issues.17 which is based on the idea of international equity, environmental degradation has its origin mainly in industrialised countries and they should, therefore, be primarily responsible for eradicating environmental pollution. These countries usually also have greater capacity to respond to environmental problems and they should, therefore, assist developing countries in accessing relevant resources and technologies to achieve sustainable development.179 As a result of the difference in the social, economic, and ecological circumstances of states, the environmental standards applied to industrialised and developing countries cannot be the same, hence the need for a differentiated approach.180 In the context of outer space, non-space-faring nations insist that the space faring nations (thus mainly industrialised countries) that have caused (and continue to cause) the current levels of space pollution, should bear the main responsibility to improve the situation, so as to guarantee the possibility of future space activity (including that of developing states). Space-faring nations are obviously in a better position to take the necessary action in this regard.181 Although the principle of 'common but differentiated responsibilities' is not included in any of the outer space treaties, Viikari submits that the space sector might be more receptive to the principle in future in view of the general movement towards creating multilateral accountability.182 She suggests the creation of a space fund as an expression of the ideals of common but differentiated responsibilities. The fund can be used for the benefit of future generations. Such a fund is in conformity with the notion, referred to earlier, that states are the trustees of mankind's common¶ resources

#### Climate change not only causes structural violence, extinction, and death in developing countries, but in developed countries too

(Abrahm **Lustgarten, 2020**- senior environmental reporter at ProPublica, “HOW CLIMATE MIGRATION WILL RESHAPE AMERICA,” 15 September 2020, New York Times, https://www.nytimes.com/interactive/2020/09/15/magazine/climate-crisis-migration-america.html)//ak//

August besieged California with a heat unseen in generations. A surge in air-conditioning broke the state’s electrical grid, leaving a population already ravaged by the coronavirus to work remotely by the dim light of their cellphones. By midmonth, the state had recorded possibly the hottest temperature ever measured on earth — 130 degrees in Death Valley — and an otherworldly storm of lightning had cracked open the sky. From Santa Cruz to Lake Tahoe, thousands of bolts of electricity exploded down onto withered grasslands and forests, some of them already hollowed out by climate-driven infestations of beetles and kiln-dried by the worst five-year drought on record. Soon, California was on fire. Over the next two weeks, 900 blazes incinerated six times as much land as all the state’s 2019 wildfires combined, forcing 100,000 people from their homes. Three of the largest fires in history burned simultaneously in a ring around the San Francisco Bay Area. Another fire burned just 12 miles from my home in Marin County. I watched as towering plumes of smoke billowed from distant hills in all directions and air tankers crisscrossed the skies. Like many Californians, I spent those weeks worrying about what might happen next, wondering how long it would be before an inferno of 60-foot flames swept up the steep, grassy hillside on its way toward my own house, rehearsing in my mind what my family would do to escape. But I also had a longer-term question, about what would happen once this unprecedented fire season ended. Was it finally time to leave for good? I had an unusual perspective on the matter. For two years, I have been studying how climate change will influence global migration. My sense was that of all the devastating consequences of a warming planet — changing landscapes, pandemics, mass extinctions — [the potential movement of hundreds of millions of climate refugees across the planet](https://www.nytimes.com/interactive/2020/07/23/magazine/climate-migration.html) stands to be among the most important. I traveled across four countries to witness how rising temperatures were driving climate refugees away from some of the poorest and hottest parts of the world. I had also helped create an enormous computer simulation to analyze how global demographics might shift, and now I was working on a data-mapping project about migration here in the United States. So it was with some sense of recognition that I faced the fires these last few weeks. In recent years, summer has brought a season of fear to California, with ever-worsening wildfires closing in. But this year felt different. The hopelessness of the pattern was now clear, and the pandemic had already uprooted so many Americans. Relocation no longer seemed like such a distant prospect. Like the subjects of my reporting, climate change had found me, its indiscriminate forces erasing all semblance of normalcy. Suddenly I had to ask myself the very question I’d been asking others: Was it time to move? I am far from the only American facing such questions. This summer has seen more fires, more heat, more storms — all of it making life increasingly untenable in larger areas of the nation. Already, droughts regularly threaten food crops across the West, while destructive floods inundate towns and fields from the Dakotas to Maryland, [collapsing dams in Michigan](https://www.nytimes.com/2020/05/21/climate/dam-failure-michigan-climate-change.html) and [raising the shorelines of the Great Lakes](https://www.nytimes.com/2019/08/24/us/great-lakes-water-levels.html#:~:text=Though%20water%20levels%20have%20always,warmer%20temperatures%20and%20increased%20evaporation.&text=MICH.,-CANADA). Rising seas and increasingly violent hurricanes are making thousands of miles of American shoreline nearly uninhabitable. As California burned, Hurricane Laura pounded the Louisiana coast with 150-mile-an-hour winds, killing at least 25 people; it was the 12th named storm to form by that point in 2020, another record. Phoenix, meanwhile, endured 53 days of 110-degree heat — 20 more days than the previous record. For years, Americans have avoided confronting these changes in their own backyards. The decisions we make about where to live are distorted not just by politics that play down climate risks, but also by expensive subsidies and incentives aimed at defying nature. In much of the developing world, vulnerable people will attempt to flee the emerging perils of global warming, seeking cooler temperatures, more fresh water and safety. But here in the United States, people have largely gravitated toward environmental danger, building along coastlines from New Jersey to Florida and settling across the cloudless deserts of the Southwest. I wanted to know if this was beginning to change. Might Americans finally be waking up to how climate is about to transform their lives? And if so — if a great domestic relocation might be in the offing — was it possible to project where we might go? To answer these questions, I interviewed more than four dozen experts: economists and demographers, climate scientists and insurance executives, architects and urban planners, and I mapped out the danger zones that will close in on Americans over the next 30 years. The maps for the first time combined exclusive climate data from the Rhodium Group, an independent data-analytics firm; wildfire projections modeled by United States Forest Service researchers and others; and data about America’s shifting climate niches, an evolution of work first published by The Proceedings of the National Academy of Sciences last spring. (See a detailed analysis of the maps.) What I found was a nation on the cusp of a great transformation. Across the United States, some 162 million people — nearly one in two — will most likely experience a decline in the quality of their environment, namely more heat and less water. For 93 million of them, the changes could be particularly severe, and by 2070, our analysis suggests, if carbon emissions rise at extreme levels, at least four million Americans could find themselves living at the fringe, in places decidedly outside the ideal niche for human life. The cost of resisting the new climate reality is mounting. Florida officials have already acknowledged that defending some roadways against the sea will be unaffordable. And the nation’s federal flood-insurance program is for the first time requiring that some of its payouts be used to retreat from climate threats across the country. It will soon prove too expensive to maintain the status quo. By 2070, some 28 million people across the country could face Manhattan-size megafires. In Northern California, they could become an annual event. Then what? One influential 2018 study, published in The Journal of the Association of Environmental and Resource Economists, suggests that one in 12 Americans in the Southern half of the country will move toward California, the Mountain West or the Northwest over the next 45 years because of climate influences alone. Such a shift in population is likely to increase poverty and widen the gulf between the rich and the poor. It will accelerate rapid, perhaps chaotic, urbanization of cities ill-equipped for the burden, testing their capacity to provide basic services and amplifying existing inequities. It will eat away at prosperity, dealing repeated economic blows to coastal, rural and Southern regions, which could in turn push entire communities to the brink of collapse. This process has already begun in rural Louisiana and coastal Georgia, where low-income and Black and Indigenous communities face environmental change on top of poor health and extreme poverty. Mobility itself, global-migration experts point out, is often a reflection of relative wealth, and as some move, many others will be left behind. Those who stay risk becoming trapped as the land and the society around them ceases to offer any more support. There are signs that the message is breaking through. Half of Americans now rank climate as a top political priority, up from roughly one-third in 2016, and three out of four now describe climate change as either “a crisis” or “a major problem.” This year, Democratic caucusgoers in Iowa, where tens of thousands of acres of farmland flooded in 2019, ranked climate second only to health care as an issue. A poll by researchers at Yale and George Mason Universities found that even Republicans’ views are shifting: One in three now think climate change should be declared a national emergency. Policymakers, having left America unprepared for what’s next, now face brutal choices about which communities to save — often at exorbitant costs — and which to sacrifice. Their decisions will almost inevitably make the nation more divided, with those worst off relegated to a nightmare future in which they are left to fend for themselves. Nor will these disruptions wait for the worst environmental changes to occur. The wave begins when individual perception of risk starts to shift, when the environmental threat reaches past the least fortunate and rattles the physical and financial security of broader, wealthier parts of the population. It begins when even places like California’s suburbs are no longer safe. It has already begun. Let’s start with some basics. Across the country, it’s going to get hot. Buffalo may feel in a few decades like Tempe, Ariz., does today, and Tempe itself will sustain 100-degree average summer temperatures by the end of the century. Extreme humidity from New Orleans to northern Wisconsin will make summers increasingly unbearable, turning otherwise seemingly survivable heat waves into debilitating health threats. Fresh water will also be in short supply, not only in the West but also in places like Florida, Georgia and Alabama, where droughts now regularly wither cotton fields. By 2040, according to federal government projections, extreme water shortages will be nearly ubiquitous west of Missouri. The Memphis Sands Aquifer, a crucial water supply for Mississippi, Tennessee, Arkansas and Louisiana, is already overdrawn by hundreds of millions of gallons a day. Much of the Ogallala Aquifer — which supplies nearly a third of the nation’s irrigation groundwater — could be gone by the end of the century. It can be difficult to see the challenges clearly because so many factors are in play. At least 28 million Americans are likely to face megafires like the ones we are now seeing in California, in places like Texas and Florida and Georgia. At the same time, 100 million Americans — largely in the Mississippi River Basin from Louisiana to Wisconsin — will increasingly face humidity so extreme that working outside or playing school sports could cause heatstroke. Crop yields will be decimated from Texas to Alabama and all the way north through Oklahoma and Kansas and into Nebraska. The challenges are so widespread and so interrelated that Americans seeking to flee one could well run into another. I live on a hilltop, 400 feet above sea level, and my home will never be touched by rising waters. But by the end of this century, if the more extreme projections of eight to 10 feet of sea-level rise come to fruition, the shoreline of San Francisco Bay will move three miles closer to my house, as it subsumes some 166 square miles of land, including a high school, a new county hospital and the store where I buy groceries. The freeway to San Francisco will need to be raised, and to the east, a new bridge will be required to connect the community of Point Richmond to the city of Berkeley. The Latino, Asian and Black communities who live in the most-vulnerable low-lying districts will be displaced first, but research from Mathew Hauer, a sociologist at Florida State University who published some of the first modeling of American climate migration in the journal Nature Climate Change in 2017, suggests that the toll will eventually be far more widespread: Nearly one in three people here in Marin County will leave, part of the roughly 700,000 who his models suggest may abandon the broader Bay Area as a result of sea-level rise alone. From Maine to North Carolina to Texas, rising sea levels are not just chewing up shorelines but also raising rivers and swamping the subterranean infrastructure of coastal communities, making a stable life there all but impossible. Coastal high points will be cut off from roadways, amenities and escape routes, and even far inland, saltwater will seep into underground drinking-water supplies. Eight of the nation’s 20 largest metropolitan areas — Miami, New York and Boston among them — will be profoundly altered, indirectly affecting some 50 million people. Imagine large concrete walls separating Fort Lauderdale condominiums from a beachless waterfront, or dozens of new bridges connecting the islands of Philadelphia. Not every city can spend $100 billion on a sea wall, as New York most likely will. Barrier islands? Rural areas along the coast without a strong tax base? They are likely, in the long term, unsalvageable. In all, Hauer projects that 13 million Americans will be forced to move away from submerged coastlines. Add to that the people contending with wildfires and other risks, and the number of Americans who might move — though difficult to predict precisely — could easily be tens of millions larger. Even 13 million climate migrants, though, would rank as the largest migration in North American history. The Great Migration — of six million Black Americans out of the South from 1916 to 1970 — transformed almost everything we know about America, from the fate of its labor movement to the shape of its cities to the sound of its music. What would it look like when twice that many people moved? What might change? Americans have been conditioned not to respond to geographical climate threats as people in the rest of the world do. It is natural that rural Guatemalans or subsistence farmers in Kenya, facing drought or scorching heat, would seek out someplace more stable and resilient. Even a subtle environmental change — a dry well, say — can mean life or death, and without money to address the problem, migration is often simply a question of survival. By comparison, Americans are richer, often much richer, and more insulated from the shocks of climate change. They are distanced from the food and water sources they depend on, and they are part of a culture that sees every problem as capable of being solved by money. So even as the average flow of the Colorado River — the water supply for 40 million Western Americans and the backbone of the nation’s vegetable and cattle farming — has declined for most of the last 33 years, the population of Nevada has doubled. At the same time, more than 1.5 million people have moved to the Phoenix metro area, despite its dependence on that same river (and the fact that temperatures there now regularly hit 115 degrees). Since Hurricane Andrew devastated Florida in 1992 — and even as that state has become a global example of the threat of sea-level rise — more than five million people have moved to Florida’s shorelines, driving a historic boom in building and real estate. The sense that money and technology can overcome nature has emboldened Americans. Where money and technology fail, though, it inevitably falls to government policies — and government subsidies — to pick up the slack. Thanks to federally subsidized canals, for example, water in part of the Desert Southwest costs less than it does in Philadelphia. The federal National Flood Insurance Program has paid to rebuild houses that have flooded six times over in the same spot. And federal agriculture aid withholds subsidies from farmers who switch to drought-resistant crops, while paying growers to replant the same ones that failed. Farmers, seed manufacturers, real estate developers and a few homeowners benefit, at least momentarily, but the gap between what the climate can destroy and what money can replace is growing. Perhaps no market force has proved more influential — and more misguided — than the nation’s property-insurance system. From state to state, readily available and affordable policies have made it attractive to buy or replace homes even where they are at high risk of disasters, systematically obscuring the reality of the climate threat and fooling many Americans into thinking that their decisions are safer than they actually are. Part of the problem is that most policies look only 12 months into the future, ignoring long-term trends even as insurance availability influences development and drives people’s long-term decision-making. Even where insurers have tried to withdraw policies or raise rates to reduce climate-related liabilities, state regulators have forced them to provide affordable coverage anyway, simply subsidizing the cost of underwriting such a risky policy or, in some cases, offering it themselves. The regulations — called Fair Access to Insurance Requirements — are justified by developers and local politicians alike as economic lifeboats “of last resort” in regions where climate change threatens to interrupt economic growth. While they do protect some entrenched and vulnerable communities, the laws also satisfy the demand of wealthier homeowners who still want to be able to buy insurance. At least 30 states, including Louisiana, Massachusetts, North Carolina and Texas, have developed so-called FAIR plans, and today they serve as a market backstop in the places facing the highest risks of climate-driven disasters, including coastal flooding, hurricanes and wildfires. In an era of climate change, though, such policies amount to a sort of shell game, meant to keep growth going even when other obvious signs and scientific research suggest that it should stop. That’s what happened in Florida. Hurricane Andrew reduced parts of cities to landfill and cost insurers nearly $16 billion in payouts. Many insurance companies, recognizing the likelihood that it would happen again, declined to renew policies and left the state. So the Florida Legislature created a state-run company to insure properties itself, preventing both an exodus and an economic collapse by essentially pretending that the climate vulnerabilities didn’t exist. As a result, Florida’s taxpayers by 2012 had assumed liabilities worth some $511 billion — more than seven times the state’s total budget — as the value of coastal property topped $2.8 trillion. Another direct hurricane risked bankrupting the state. Florida, concerned that it had taken on too much risk, has since scaled back its self-insurance plan. But the development that resulted is still in place. On a sweltering afternoon last October, with the skies above me full of wildfire smoke, I called Jesse Keenan, an urban-planning and climate-change specialist then at Harvard’s Graduate School of Design, who advises the federal Commodity Futures Trading Commission on market hazards from climate change. Keenan, who is now an associate professor of real estate at Tulane University’s School of Architecture, had been in the news last year for projecting where people might move to — suggesting that Duluth, Minn., for instance, should brace for a coming real estate boom as climate migrants move north. But like other scientists I’d spoken with, Keenan had been reluctant to draw conclusions about where these migrants would be driven from. Last fall, though, as the previous round of fires ravaged California, his phone began to ring, with private-equity investors and bankers all looking for his read on the state’s future. Their interest suggested a growing investor-grade nervousness about swiftly mounting environmental risk in the hottest real estate markets in the country. It’s an early sign, he told me, that the momentum is about to switch directions. “And once this flips,” he added, “it’s likely to flip very quickly.” In fact, the correction — a newfound respect for the destructive power of nature, coupled with a sudden disavowal of Americans’ appetite for reckless development — had begun two years earlier, when a frightening surge in disasters offered a jolting preview of how the climate crisis was changing the rules. On October 9, 2017, a wildfire blazed through the suburban blue-collar neighborhood of Coffey Park in Santa Rosa, Calif., virtually in my own backyard. I awoke to learn that more than 1,800 buildings were reduced to ashes, less than 35 miles from where I slept. Inchlong cinders had piled on my windowsills like falling snow. The Tubbs Fire, as it was called, shouldn’t have been possible. Coffey Park is surrounded not by vegetation but by concrete and malls and freeways. So insurers had rated it as “basically zero risk,” according to Kevin Van Leer, then a risk modeler from the global insurance liability firm Risk Management Solutions. (He now does similar work for Cape Analytics.) But Van Leer, who had spent seven years picking through the debris left by disasters to understand how insurers could anticipate — and price — the risk of their happening again, had begun to see other “impossible” fires. After a 2016 fire tornado ripped through northern Canada and a firestorm consumed Gatlinburg, Tenn., he said, “alarm bells started going off” for the insurance industry. What Van Leer saw when he walked through Coffey Park a week after the Tubbs Fire changed the way he would model and project fire risk forever. Typically, fire would spread along the ground, burning maybe 50 percent of structures. In Santa Rosa, more than 90 percent had been leveled. “The destruction was complete,” he told me. Van Leer determined that the fire had jumped through the forest canopy, spawning 70-mile-per-hour winds that kicked a storm of embers into the modest homes of Coffey Park, which burned at an acre a second as homes ignited spontaneously from the radiant heat. It was the kind of thing that might never have been possible if California’s autumn winds weren’t getting fiercer and drier every year, colliding with intensifying, climate-driven heat and ever-expanding development. “It’s hard to forecast something you’ve never seen before,” he said. For me, the awakening to imminent climate risk came with California’s rolling power blackouts last fall — an effort to pre-emptively avoid the risk of a live wire sparking a fire — which showed me that all my notional perspective about climate risk and my own life choices were on a collision course. After the first one, all the food in our refrigerator was lost. When power was interrupted six more times in three weeks, we stopped trying to keep it stocked. All around us, small fires burned. Thick smoke produced fits of coughing. Then, as now, I packed an ax and a go-bag in my car, ready to evacuate. As former Gov. Jerry Brown said, it was beginning to feel like the “new abnormal.” It was no surprise, then, that California’s property insurers — having watched 26 years’ worth of profits dissolve over 24 months — began dropping policies, or that California’s insurance commissioner, trying to slow the slide, placed a moratorium on insurance cancellations for parts of the state in 2020. In February, the Legislature introduced a bill compelling California to, in the words of one consumer advocacy group, “follow the lead of Florida” by mandating that insurance remain available, in this case with a requirement that homeowners first harden their properties against fire. At the same time, participation in California’s FAIR plan for catastrophic fires has grown by at least 180 percent since 2015, and in Santa Rosa, houses are being rebuilt in the very same wildfire-vulnerable zones that proved so deadly in 2017. Given that a new study projects a 20 percent increase in extreme-fire-weather days by 2035, such practices suggest a special form of climate negligence. It’s only a matter of time before homeowners begin to recognize the unsustainability of this approach. Market shock, when driven by the sort of cultural awakening to risk that Keenan observes, can strike a neighborhood like an infectious disease, with fear spreading doubt — and devaluation — from door to door. It happened that way in the foreclosure crisis. By 2060 in Florida and elsewhere, the costs of sea-level rise and hurricanes will be compounded by knock-on economic challenges, from growing crime to falling productivity. Keenan calls the practice of drawing arbitrary lending boundaries around areas of perceived environmental risk “bluelining,” and indeed many of the neighborhoods that banks are bluelining are the same as the ones that were hit by the racist redlining practice in days past. This summer, climate-data analysts at the First Street Foundation released maps showing that 70 percent more buildings in the United States were vulnerable to flood risk than previously thought; most of the underestimated risk was in low-income neighborhoods. Such neighborhoods see little in the way of flood-prevention investment. My Bay Area neighborhood, on the other hand, has benefited from consistent investment in efforts to defend it against the ravages of climate change. That questions of livability had reached me, here, were testament to Keenan’s belief that the bluelining phenomenon will eventually affect large majorities of equity-holding middle-class Americans too, with broad implications for the overall economy, starting in the nation’s largest state. Under the radar, a new class of dangerous debt — climate-distressed mortgage loans — might already be threatening the financial system. Lending data analyzed by Keenan and his co-author, Jacob Bradt, for a study published in the journal Climatic Change in June shows that small banks are liberally making loans on environmentally threatened homes, but then quickly passing them along to federal mortgage backers. At the same time, they have all but stopped lending money for the higher-end properties worth too much for the government to accept, suggesting that the banks are knowingly passing climate liabilities along to taxpayers as stranded assets. Once home values begin a one-way plummet, it’s easy for economists to see how entire communities spin out of control. The tax base declines and the school system and civic services falter, creating a negative feedback loop that pushes more people to leave. Rising insurance costs and the perception of risk force credit-rating agencies to downgrade towns, making it more difficult for them to issue bonds and plug the springing financial leaks. Local banks, meanwhile, keep securitizing their mortgage debt, sloughing off their own liabilities. Keenan, though, had a bigger point: All the structural disincentives that had built Americans’ irrational response to the climate risk were now reaching their logical endpoint. A pandemic-induced economic collapse will only heighten the vulnerabilities and speed the transition, reducing to nothing whatever thin margin of financial protection has kept people in place. Until now, the market mechanisms had essentially socialized the consequences of high-risk development. But as the costs rise — and the insurers quit, and the bankers divest, and the farm subsidies prove too wasteful, and so on — the full weight of responsibility will fall on individual people. And that’s when the real migration might begin. As I spoke with Keenan last year, I looked out my own kitchen window onto hillsides of parkland, singed brown by months of dry summer heat. This was precisely the land that my utility, Pacific Gas & Electric, had three times identified as such an imperiled tinderbox that it had to shut off power to avoid fire. It was precisely the kind of wildland-urban interface that all the studies I read blamed for heightening Californians’ exposure to climate risks. I mentioned this on the phone and then asked Keenan, “Should I be selling my house and getting — ” He cut me off: “Yes.” Americans have dealt with climate disaster before. The Dust Bowl started after the federal government expanded the Homestead Act to offer more land to settlers willing to work the marginal soil of the Great Plains. Millions took up the invitation, replacing hardy prairie grass with thirsty crops like corn, wheat and cotton. Then, entirely predictably, came the drought. From 1929 to 1934, crop yields across Texas, Oklahoma, Kansas and Missouri plunged by 60 percent, leaving farmers destitute and exposing the now-barren topsoil to dry winds and soaring temperatures. The resulting dust storms, some of them taller than skyscrapers, buried homes whole and blew as far east as Washington. The disaster propelled an exodus of some 2.5 million people, mostly to the West, where newcomers — “Okies” not just from Oklahoma but also Texas, Arkansas and Missouri — unsettled communities and competed for jobs. Colorado tried to seal its border from the climate refugees; in California, they were funneled into squalid shanty towns. Only after the migrants settled and had years to claw back a decent life did some towns bounce back stronger. The places migrants left behind never fully recovered. Eighty years later, Dust Bowl towns still have slower economic growth and lower per capita income than the rest of the country. Dust Bowl survivors and their children are less likely to go to college and more likely to live in poverty. Climatic change made them poor, and it has kept them poor ever since. A Dust Bowl event will most likely happen again. The Great Plains states today provide nearly half of the nation’s wheat, sorghum and cattle and much of its corn; the farmers and ranchers there export that food to Africa, South America and Asia. Crop yields, though, will drop sharply with every degree of warming. By 2050, researchers at the University of Chicago and the NASA Goddard Institute for Space Studies found, Dust Bowl-era yields will be the norm, even as demand for scarce water jumps by as much as 20 percent. Another extreme drought would drive near-total crop losses worse than the Dust Bowl, kneecapping the broader economy. At that point, the authors write, “abandonment is one option.” Corn and soy production will decrease with every degree of warming. By 2060, parts of Texas may experience a drop in yields of more than 92 percent. Projections are inherently imprecise, but the gradual changes to America’s cropland — plus the steady baking and burning and flooding — suggest that we are already witnessing a slower-forming but much larger replay of the Dust Bowl that will destroy more than just crops. In 2017, Solomon Hsiang, a climate economist at the University of California, Berkeley, led an analysis of the economic impact of climate-driven changes like rising mortality and rising energy costs, finding that the poorest counties in the United States — mostly across the South and the Southwest — will in some extreme cases face damages equal to more than a third of their gross domestic products. The 2018 National Climate Assessment also warns that the U.S. economy over all could contract by 10 percent. That kind of loss typically drives people toward cities, and researchers expect that trend to continue after the Covid-19 pandemic ends. In 1950, less than 65 percent of Americans lived in cities. By 2050, only 10 percent will live outside them, in part because of climatic change. By 2100, Hauer estimates, Atlanta, Orlando, Houston and Austin could each receive more than a quarter million new residents as a result of sea-level displacement alone, meaning it may be those cities — not the places that empty out — that wind up bearing the brunt of America’s reshuffling. The World Bank warns that fast-moving climate urbanization leads to rising unemployment, competition for services and deepening poverty. So what will happen to Atlanta — a metro area of 5.8 million people that may lose its water supply to drought and that our data also shows will face an increase in heat-driven wildfires? Hauer estimates that hundreds of thousands of climate refugees will move into the city by 2100, swelling its population and stressing its infrastructure. Atlanta — where poor transportation and water systems contributed to the state’s C+ infrastructure grade last year — already suffers greater income inequality than any other large American city, making it a virtual tinderbox for social conflict. One in 10 households earns less than $10,000 a year, and rings of extreme poverty are growing on its outskirts even as the city center grows wealthier. Atlanta has started bolstering its defenses against climate change, but in some cases this has only exacerbated divisions. When the city converted an old Westside rock quarry into a reservoir, part of a larger greenbelt to expand parkland, clean the air and protect against drought, the project also fueled rapid upscale growth, driving the poorest Black communities further into impoverished suburbs. That Atlanta hasn’t “fully grappled with” such challenges now, says Na’Taki Osborne Jelks, chair of the West Atlanta Watershed Alliance, means that with more people and higher temperatures, “the city might be pushed to what’s manageable.” So might Philadelphia, Chicago, Washington, Boston and other cities with long-neglected systems suddenly pressed to expand under increasingly adverse conditions. Once you accept that climate change is fast making large parts of the United States nearly uninhabitable, the future looks like this: With time, the bottom half of the country grows inhospitable, dangerous and hot. Something like a tenth of the people who live in the South and the Southwest — from South Carolina to Alabama to Texas to Southern California — decide to move north in search of a better economy and a more temperate environment. Those who stay behind are disproportionately poor and elderly. In these places, heat alone will cause as many as 80 additional deaths per 100,000 people — the nation’s opioid crisis, by comparison, produces 15 additional deaths per 100,000. The most affected people, meanwhile, will pay 20 percent more for energy, and their crops will yield half as much food or in some cases virtually none at all. That collective burden will drag down regional incomes by roughly 10 percent, amounting to one of the largest transfers of wealth in American history, as people who live farther north will benefit from that change and see their fortunes rise. The millions of people moving north will mostly head to the cities of the Northeast and Northwest, which will see their populations grow by roughly 10 percent, according to one model. Once-chilly places like Minnesota and Michigan and Vermont will become more temperate, verdant and inviting. Vast regions will prosper; just as Hsiang’s research forecast that Southern counties could see a tenth of their economy dry up, he projects that others as far as North Dakota and Minnesota will enjoy a corresponding expansion. Cities like Detroit, Rochester, Buffalo and Milwaukee will see a renaissance, with their excess capacity in infrastructure, water supplies and highways once again put to good use. One day, it’s possible that a high-speed rail line could race across the Dakotas, through Idaho’s up-and-coming wine country and the country’s new breadbasket along the Canadian border, to the megalopolis of Seattle, which by then has nearly merged with Vancouver to its north. Sitting in my own backyard one afternoon this summer, my wife and I talked through the implications of this looming American future. The facts were clear and increasingly foreboding. Yet there were so many intangibles — a love of nature, the busy pace of life, the high cost of moving — that conspired to keep us from leaving. Nobody wants to migrate away from home, even when an inexorable danger is inching ever closer. They do it when there is no longer any other choice.