### T

#### T – Appropriation:

#### Interpretation: Appropriation means use, exploitation, or occupation that is permanent and to the exclusion of others

Babcock 19 Professor of Law, Georgetown University Law Cente. Babcock, Hope M. "The Public Trust Doctrine, Outer Space, and the Global Commons: Time to Call Home ET." Syracuse L. Rev. 69 (2019): 191.

Article II is one of those succeeding provisions that curtails “the freedom of use outlined in Article [I] by declaring that outer space, including the [m]oon and other celestial bodies, is not subject to national appropriation.”147 It flatly prohibits national appropriation of any celestial body in outer space “by means of use or occupation, or by any other means.”148 However, “many types of ‘use’ or ‘exploitation’. . . are inconceivable without appropriation of some degree at least of any materials taken,” like ore or water.149 If this view of Article II’s prohibitory language is correct, then “it is not at all farfetched to say that the OST actually installs a blanket prohibition on many beneficial forms of development.”150 However, the OST only prohibits an appropriation that constitutes a “long-term use and permanent occupation, to the exclusion of all others.”151

#### Violation: Constellations do not appropriate – reject non-legal interpretations

Johnson 20 [Chris Johnson is the Space Law Advisor for Secure World Foundation and has nine years of professional experience in international space law and policy. He has authored and co-authored publications on international space law, national space legislation, international cooperation in space, human-robotic cooperative space exploration, and on the societal benefits of space technology for Africa. "The Legal Status of MegaLEO Constellations and Concerns About Appropriation of Large Swaths of Earth Orbit." https://swfound.org/media/206951/johnson2020\_referenceworkentry\_thelegalstatusofmegaleoconstel.pdf]

No, This Is Not Impermissible Appropriation

An opposite conclusion can also be reasonably arrived at when approached along the following lines. The counter argument would assert that the deployment and operation of these global constellations, such as SpaceX’s Starlink, OneWeb, Kepler, etc., are aligned with and in full conformity with the laws applicable to outer space. These constellations are merely the exercise and enjoyment of the freedom of exploration and use of outer space and do not constitute any impermissible appropriation of the orbits that they transit.

Freedom of Access and Use Permits Constellations

Rather than being a violation of other’s rights to access and explore outer space, the deployment of these constellations is more correctly viewed as the exercise and enjoyment of the right to access and use outer space. Article I of the Outer Space Treaty establishes a right to access and use space without discrimination.

Not allowing an actor to deploy spacecraft, regardless of their number or destination, would be infringing with the exercise of their freedom. It would be discriminatory. Additionally, actors do not need permission from any other State, or group of States, to access and explore outer space.

Aligned with the Intentions of the Outer Space Treaty

This use of outer space by constellations in LEO, while not explicitly mentioned by the drafters of the Outer Space Treaty or other space law, actually is the fulfillment of their visions for the use of outer space. The preamble to the Outer Space Treaty (which contains the subject matter and purpose of the treaty and can be used for interpreting the operative articles of the treaty) speaks of the aspirations of humanity in exploring and using outer space. It is easy to see constellations that will provide Internet access to the world as fulfilling the visions of the drafters:

The States Parties to this Treaty,

Inspired by the great prospects opening up before mankind as a result of man’s entry into outer space,

Recognizing the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes,

Believing that the exploration and use of outer space should be carried on for the benefit of all peoples irrespective of the degree of their economic or scientific development,

Desiring to contribute to broad international cooperation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes,

Believing that such cooperation will contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples,

As such, subsequent article of the Outer Space Treaty should be read in a permissive light, as permitting constellations, rather than a restrictive light which only sees potential negative aspects of constellations.

Due Regard and Harmful Contamination Will be Addressed

Operators in LEO are well aware of the challenges to space sustainability that their constellations will pose and will be taking efforts to mitigate the creation of debris. OneWeb is keenly focused on space sustainability and has even argued that the current norm, whereby spacecraft are not in space for longer than 25 years and are deorbited from lower orbits at the end of their lifetime (aka post mission disposal), is not sufficient to keep outer space clean and that shorter lifespan limits should be imposed on operators, especially operators in LEO, and operators of small satellites.

Additionally, these systems will be able to cooperate with emerging space safety and space traffic management plans and can operate in ways that do not restrict or impinge on other users of the space domain. Because due regard is therefore displayed for the space domain, and to the interests of others, these constellations do not prejudice or infringe upon the freedoms of use and exploration of the space domain and are therefore not occupation, or possession, much less appropriation.

This Does Not Constitute Possession, or Ownership, or Occupation

The use of LEO by satellite constellations is substantially similar to the use of GSO, and therefore permissible. In each region, individual actors are given permission - either from a national administrator or from an international governing body (the ITU) via a national administer–to use precoordinated subsections of space. In a way that is overwhelmingly similar to the use of orbital slots in GSO, the placement of spacecraft into orbits in LEO or higher orbits does not constitute possession, ownership, or occupation of those orbits. This is because States (and their companies) have been occupying orbital slots in GSO for decades, and these uses of GSO have never been accused of “appropriating” GSO. The users have never claimed to be appropriating GSO, and their exercising of rights to use GSO is respected by other actors in the space domain. This is the same situation for other orbits, including LEO and other non-Geostationary orbits.

And while GSO locations are relatively stable (subject to space weather and other perturbations, and require stationkeeping), spacecraft in LEO are actually moving through space and are not stationary, so it is even more difficult to see this use by constellations as occupation, much less appropriation. Moreover, Space Situational Awareness (SSA) and Space Traffic Management (STM) will allow other uses to use these orbits, and nothing about the use of any one user necessarily precludes others. Lastly, there is no intention by operators of constellations to exclusively occupy, must less possess or appropriate, these orbits. Would not the appropriation of outer space be an intentional, volutional act? No such intention can be found in the operators of global constellations.

#### 1] Precision – if we win definitions the aff doesn’t defend a shift from the squo or solve their advantages – so at best vote negative on presumption. The resolution is the only predictable stasis point for dividing ground—any deviation justifies the aff arbitrarily jettisoning words in the resolution at their whim which decks negative ground and preparation because the aff is no longer bounded by the resolution.

#### 2] Predictable limits—including satellite slots offers huge explosion in the topic since they get permutations of different satellite systems – LEO MEO and HEO, plus different companies, plus sizes of constellations, et cetera. Letting temporary occupation be appropriation is a limits diaster - any aff about a single space ship, satellite, or weapon would be T because they temporarily occupy space. Limits explodes neg prep burden and draws un-reciprocal lines of debate, where the aff is always ahead, turns their pragmatics offense

#### Topicality is a voting issue that should be evaluated through competing interpretations – it tells the negative what they do and do not have to prepare for—there’s no way for the negative to know what constitutes a “reasonable interpretation” when we do prep – reasonability is arbitrary and causes a race to the bottom, proliferating abuse

#### No RVIs—it’s your burden to be topical.

### DA

#### Counterplan: Investment into the appropriation of Outer Space through large satellite constellations in Low Earth Orbit by private companies in Asia for the purposes of emergency communications in the event of disaster relief or external shocks is just.

#### Private LEO constellations are economically viable in the long term, but require upfront investment – those uniquely solve disaster response because of satellite internet’s connectivity options for island countries

Garrity and Husar 21 Garrity, John, and Arndt Husar. John Garrity is an economist, policy advisor, and project manager focusing on digital inclusion, universal internet access policy, and last-mile connectivity. He has coauthored numerous reports on technology and development and has presented around the world on efforts to close the digital divide. Arndt Husar facilitates the effective use of digital technology, advising ADB clients, regional departments, as well as sector and thematic groups on digital transformation. " Digital Connectivity and Low Earth Orbit Satellite Constellations: Opportunities for Asia and the Pacific." (2021).

Satellite communication plays a necessary role in the global connectivity ecosystem, connecting rural and remote populations, providing backhaul connectivity to mobile cellular networks, and rapidly establishing communication in emergency and disaster response scenarios. This Asian Development Bank (ADB) Sustainable Development Working Paper, the first in a series reviewing emerging innovations in connectivity technologies, focuses on low Earth orbit (LEO) satellites, which have been in deployment for decades and are again a subject of intensive investment as new large constellations are in early stages of deployment. These new LEO constellations, such as those being deployed by Starlink by SpaceX, Project Kuiper by Amazon, OneWeb, Lightspeed by Telesat, among others, may prove to be transformational to the connectivity landscape based on their global coverage and their suitability for areas not served by fiber optic cable networks. ADB’s developing member countries are well placed to leverage and benefit from this expansion of internet connectivity, particularly for underserved geographies and countries with limited international internet bandwidth, such as landlocked developing countries and small island developing states. With their global reach and coverage, LEO constellations are expected to dramatically expand the availability of high-speed broadband internet access with levels of service that rival fiber optic cables in terms of speed and latency, and at significantly reduced price levels compared to traditional geostationary satellites. A proactive engagement with LEO solutions is likely to yield benefits as the relevant business models are still evolving. Well-informed early action by regulators and investors can ensure that developing member countries prepare for opportunities presented by the anticipated expansion of connectivity bandwidth. I. IntRoDUCtIon This Emerging Connectivity Innovations Case Study on SpaceX Starlink and low Earth orbit (LEO) satellite constellations is intended to provide readers, particularly in developing countries in Asia and the Pacific, with a background understanding of the role of satellite communications in global internet connectivity and an exploration of the potential impact of the next generation of LEO constellation systems. While the adoption of internet connectivity across the world has generally increased incrementally, some innovations have been transformational, dramatically expanding the geographic reach of connectivity and bandwidth capacity. For example, the introduction of basic mobile phones in the late 1990s and early 2000s led to rapid adoption of mobile telephony across low- and middle-income countries (a phenomenon known as the “mobile miracle”). Similarly, public and private investment in undersea fiber optic cables circling sub-Saharan Africa in the 2000s significantly reduced the cost of bandwidth in many countries in the region. Satellites have used low Earth orbits since the beginning of space exploration; however, private investment in LEO constellations, consisting of hundreds or thousands of satellites, has been limited because significant up-front capital expenditure is required. While it remains to be seen how the next generation of LEO satellite constellations will evolve, LEOs are forecasted to significantly increase the available internet bandwidth in remote and rural geographies not currently served by fiber optic cables. This increased bandwidth could be leveraged to increase economic and social development opportunities for individuals, organizations, businesses, and government facilities (including public schools) located in these areas, provided that the private sector satellite companies investing in LEO constellations see market opportunities to extend service to these areas. This case study is intended to introduce to Asian Development Bank developing member countries how to start preparing for the expansion of LEO satellite communication services. II. BACKGRoUnD: sAteLLIte ConneCtIVItY As A MeAns FoR BRoADBAnD InteRnet Internet connectivity has become a necessary component of every country’s critical infrastructure given the reliance of all aspects of economic activity, governance, and social development on internet communications. The coronavirus disease (COVID-19) pandemic dramatically increased the importance of internet communications infrastructure. Trade, employment, learning, leisure, and communications quickly shifted into the digital sphere and countries with robust internet infrastructure and high adoption rates of internet-enabled devices were better able to adjust and adapt to the shift to digital activity. The United Nations estimates that 1.6 billion learners were affected by school closures in 2020, affecting 94% of the world’s student population and up to 99% in low and lower middle-income countries.1 1 United Nations. 2020. Policy Brief: Education during COVID-10 and beyond. 2 ADB Sustainable Development Working Paper Series No. 76 Access to distance learning opportunities varies greatly by country and income groups, with estimates of less than half of students in low-income countries able to access distance learning.2 Internet access and adoption in the developing member countries (DMCs) of the Asian Development Bank (ADB) continues to grow, particularly as a result of public and private investment in telecommunications infrastructure, increased competition, and allocation of shared resources, such as spectrum auctions and assignment. Despite these efforts, large access gaps remain in Asia, where the most remote, difficult to reach, or sparsely populated districts remain disconnected, leaving more than half of the population without access to the internet. This lack of digital infrastructure represents a missed opportunity to accelerate economic and social development. Despite the rapid expansion of internet connectivity infrastructure across the world, significant gaps in internet adoption and infrastructure access remain. This highlights the importance of satellite communications that can bridge gaps, swiftly expand network coverage, and enhance existing infrastructure. The latest estimates from the International Telecommunication Union (ITU) show that 3.7 billion people are still not participating online (49% of the global population), and 63% of rural households are without internet access (Figure 1).3 Also, 1.5 billion people reside in areas without high-speed mobile data coverage (fourth generation long-term evolution or 4G LTE), while 607 million people reside in areas with no mobile data coverage at all (at least 4G or third generation [3G] coverage). Furthermore, 313 million people reside in areas with only basic voice and short messaging service (SMS) coverage (second generation [2G]), and 220 million people reside in areas with no cellular coverage. The ITU estimates that nearly $428 billion is required to achieve universal access to broadband globally, $251 billion of which is required for Asia, with approximately 75% coming from the private sector and the remainder with support from the public sector.4 The majority of the world’s population, over 5 billion people, live more than 10 kilometers (km) away from any fiber optic cable infrastructure (3.6 billion reside more than 25 km away).5 Other issues, such as affordability, digital literacy, and the lack of relevant or local language content, have resulted in 2.4 billion people who live within 4G coverage not subscribing to 4G data services. [FIGURE 1 OMITTED] Satellite connectivity is predominantly used for backhaul connectivity for remote cellular base stations and as a last-mile connection for individual subscribers and enterprises. Figure 2 provides an overview of the internet infrastructure network components, from international connectivity to the last mile. Because of the higher relative cost of bandwidth transmitted via satellite versus terrestrial technologies, satellite is currently primarily used in situations where fiber optic cables and other high-capacity technologies are not financially viable due to low population densities and large distances between high-capacity networks and last-mile networks.6 However, in a few cases, satellite connectivity is relied upon for international internet gateway traffic or as part of a country’s core network. For landlocked developing countries that are dependent on terrestrial fiber connectivity, in some cases, satellite connectivity serves as a substitute to complex bilateral and multilateral negotiations to extend costly fiber connectivity to their country. [FIGURE 2 OMITTED] Satellite connectivity is predominantly used for backhaul connectivity for remote cellular base stations and as a last-mile connection for individual subscribers and enterprises. Figure 2 provides an overview of the internet infrastructure network components, from international connectivity to the last mile. Because of the higher relative cost of bandwidth transmitted via satellite versus terrestrial technologies, satellite is currently primarily used in situations where fiber optic cables and other high-capacity technologies are not financially viable due to low population densities and large distances between high-capacity networks and last-mile networks.6 However, in a few cases, satellite connectivity is relied upon for international internet gateway traffic or as part of a country’s core network. For landlocked developing countries that are dependent on terrestrial fiber connectivity, in some cases, satellite connectivity serves as a substitute to complex bilateral and multilateral negotiations to extend costly fiber connectivity to their country. Particularly in situations where a high degree of data throughput is required per site, such as satellite backhaul for broadband cellular networks, the data volumes as well as the distance to the nearest backbone node play a significant role in cost comparisons between satellite connectivity versus terrestrial network deployments (microwave backhaul, in particular). Figure 4 illustrates how higher data bandwidth requirements are more cost-effectively supplied by terrestrial ground networks; however, a crossover point occurs where satellite capacity may end up being more cost-competitive, depending on different price points of satellite bandwidth and total traffic demand per month.12 Satellite connectivity is also well- suited to deploy in emergency situations, such as in response to natural disasters or other external shocks, that require expeditious deployment of network connectivity where terrestrial infrastructure is either nonexistent or destroyed. For many rural and remote communities, satellites are the only connectivity option. For geographies without direct access to fiber optic cable infrastructure or at great distances from high- capacity bandwidth capacity, satellite connectivity is the only option available. Even where terrestrial network infrastructure that could be used for backhaul connectivity is available, satellite deployments may still be preferred because satellite terminals require only electrical power and a clear line of sight to the sky. However, an expansion of terrestrial infrastructure usually requires extensive civil works (underground fiber ducts, pole attachments, or tower construction for cellular base stations), which comes with challenges such as securing the rights-of-way, permits, and having to pay the related fees. Satellite broadband is poised to become an even more important technology for addressing the growing digital divide. As information and communication technologies play an increasingly important role in commerce, government services, health care, education, and other sectors, satellite connectivity allows communities to get connected swiftly, bypassing the infrastructure deployment challenges that come with terrestrial infrastructure deployments. The role of satellite connectivity in emergency telecommunications has also been vital where the communications satellites are heavily relied upon in disaster recovery efforts.13 Satellite technology may also be complementary with traditional wired and mobile broadband, which are better suited for densely populated areas. Satellite service could become a default solution for remote areas, allowing terrestrial services to focus on improving access in their current coverage areas. Satellite connectivity is already being used for network redundancy at national levels for international internet capacity, as well as for backup in core and backhaul networks.14 The recent $50 million loan to Kacific by ADB for the deployment of a broadband satellite, which covers large parts of Southeast Asia and the Pacific, demonstrates the relevance of satellite connectivity for unserved and underserved regions.15 By deploying new satellite technology (in the Ka-band16), Kacific’s service offering is commercially viable despite the existing presence of other major competitors in Asia and the Pacific, including global entities such as Intelsat, SES, and Eutelsat, as well as more regional players such as AsiaSat, Thaicom, MEASAT, and SKY Perfect JSAT.

#### The Asia-Pacific is the most disaster-prone region in the world – the next catastrophe is a question of when, not if

Thomas Bickford et al 15, Ph.D., senior research scientist in CNA Corporation’s China Studies division, “The Role of the U.S. Army in Asia,” May, https://www.cna.org/CNA\_files/PDF/CRM-2015-U-010431-Final.pdf

Natural disasters As Typhoon Haiyan amply demonstrated when it hit the Philippines in November 2013, natural disasters can represent a significant threat to human security. In 2012, the Asia-Pacific region experienced 93 natural disasters, which affected some 75 million people.206 It is one of the most disaster-prone regions in the world:207 it is prone to typhoons and cyclones; it contains some of the world’s most active faults and volcanos; and many areas experience massive flooding. As former USARPAC commander Lieutenant General Wiercinski has noted, the only questions are when and where the next big disaster will occur. Admiral Locklear, Commander, USPACOM has noted that climate change is one of the region’s most pressing security challenges.209 While the ability to respond to natural disasters varies widely among countries in the region, even advanced countries can require international assistance, as Japan did after the March 2011 earthquake and tsunami.

#### Disasters are an existential threat---it’s try or die for response and coordination.

Frederick Tipson 13, adviser to the USIP Center of Innovation on Science, Technology, and Peacebuilding whose career has included positions in the UN Development Programme, Microsoft, Hongkong Telecom, AT&T, the Markle Foundation, the Senate Foreign Relations Committee, and the University of Virginia Law School, BA in History from Stanford, MA in IR from Yale, PhD and JD from UVA, “Natural Disasters as Threats to Peace”, 2013, United States Institute of Peace, <https://www.usip.org/sites/default/files/resources/Natural%20Disasters%20as%20Threats%20to%20Peace%20SR324.pdf> //hhb

As the three spheres of our habitat evolve and erupt, human beings frequently get in the way. Natural hazards become humanitarian disasters when they expose and exacerbate human vulnerabilities—those characteristics of societies that limit their ability to avoid major damage and recover quickly.3 Such vulnerabilities range from very concrete weaknesses in infrastructure or the exposed locations of large populated areas to more intangible dimensions of economic fragility, social cohesion, and political capacity, which affect both preparedness and recovery. Although the recent historical pattern of major storms, droughts, and earthquakes can be traced (see map 1 at the end of this report), the extent of human vulnerabilities is a complex and subjective matter, often evident only after the fact. Mortality figures are typically used as indicators of the severity of disasters. By that measure, the three worst disasters in the world since 1950 were the earthquake in Tangshan, China, in 1976 (250,000 dead), the earthquake and tsunami in the Indian Ocean in 2004 (240,000 dead), and the earthquake in Haiti in 2010 (316,000 dead).4 These three earthquakes were by no means the largest in that sixty-year time frame, but they occurred where large numbers of people were exposed and unable to protect themselves. Severity also can be measured by other direct effects: destruction, dislocation, and disease. The 2010 earthquake in Haiti not only killed more than 300,000 people but injured an additional 300,000, affected 3.7 million (30 percent of the total population), caused $8 billion in damage, and was followed by 470,000 cases of cholera with 6,631 attributable deaths. The death rate from an earthquake, hurricane, or epidemic is generally much higher in poorer societies than in richer ones, where economic damage is usually the more numerically impressive consequence. Because their constituents have come to recognize how much the damage from “acts of God” can be affected by the actions, or inactions, of human beings, political leaders are increasingly being held accountable for minimizing the foreseeable risks of extreme events. “Natural Hazards, UnNatural Disasters: The Economics of Effective Prevention” is the indicative title of one important report by the United Nations and the World Bank. Reducing the risks begins with the recognition of how vulnerable many people have become. Throughout the world, in both wealthy and poor countries, ever-larger concentrations of people live in exposed locations under fragile or unprotected conditions. Infrastructure is often inadequate or deteriorating, and there is little or no awareness or preparation even for likely natural events. Those most exposed include millions in low-lying shorelines or coastal wetlands, marginal urban slums, and huge “temporary” settlements of internally displaced persons or refugees. Many of these populations depend on international humanitarian agencies to provide food and medicine and to assist local authorities in assuring adequate water, sanitation, health services, and shelter. As urban populations grow and conditions deteriorate further, reliable access to these necessities is becoming increasingly problematic for more and more people. Demographic trends best convey the scale of the challenges. In less than twenty years, the global population will rise from 7.1 billion to more than 8 billion. Key countries will grow even more rapidly. Between 2010 and 2025, Egypt is projected to grow from 81 million people to 106 million, Pakistan from 174 million to 234 million, and Nigeria from 159 million to 258 million.5 Many more people around the world will attain middle-class incomes, but a large percentage in many countries will be young and unemployed. Half the world’s population is already twenty-five years old or younger. Projections suggest that, by 2030, the world will need to provide fifty percent more food and additional fresh water equivalent to twenty new Nile Rivers.6 In that time frame, the needs of many countries, including India and China, will begin to exceed foreseeable water supplies for consumption and irrigation. The growth of earthquake-prone megacities is perhaps most telling of all. In just over a decade, metropolitan Jakarta will go from 9.6 million to 12.8 million people, Mexico City from 20 million to 24.6 million, Delhi from 22 million to 32.9 million, and Tokyo from 37 million to nearly 40 million—and these are just four of the thirty-seven cities that will then have populations greater than 10 million.7 There were only twenty-three in 2011. One of every seven or eight people in the world will be living in one of these massive metropolises, many in huge urban slums that have few, if any, services or infrastructure. Such concentrated population centers are extremely vulnerable to even normal patterns of earthquakes, storms, drought, and disease (see map 2). Epidemics that spread within such populations are especially difficult to contain. Climate volatility adds a further dimension of growing risk. Current changes in the climate of key regions portend severe near-term effects, whether or not the consequences of global warming match the worst predictions for the longer term. Since the 1980s the number of recorded natural disasters related to weather and climate has roughly doubled. According to the above-mentioned United Nations-World Bank report, “If there is no conscious change in adaptation policies to extreme events, baseline damages [even] without climate change are expected to triple to $185 billion a year from economic and population growth alone”8 (emphasis added). Nor are these risks confined to poor or middle-income countries. The world’s largest reinsurance companies, Munich Re and Swiss Re, warn of major increases in weather-related damage in both North America and Europe over the next decade.9 Contrary to critiques from global warming skeptics, the scientific and intelligence communities actually have been cautious in predicting the human effects of climate change. The April 2012 report of the Intergovernmental Panel on Climate Change (IPCC) is relatively conservative in forecasting future climate-induced disasters.10 Likewise, the National Intelligence Council handles climate change and natural disasters in a largely conventional and understated manner.11 However, an increasing number of authoritative reports have begun to highlight the dire risks of current climate trends and the need to begin assessing the potential for plausible adverse scenarios. Both the World Bank and the UN Environment Programme warned recently that the likely rise in global mean temperatures will exceed key thresholds sooner than previously expected, with implications for both severe weather and ocean surges.12 Security specialists are beginning to take these trends to heart. The Defense Science Board warned in its 2011 report that climate changes in key regions will interact with other vulnerabilities to become serious “threat multipliers.”13 The World Economic Forum highlights the interactive implications of climate changes with governance, fiscal, population, and technology vulnerabilities.14 A recent report of the National Research Council called on foreign policy experts to consider more systematically the political and security implications of foreseeable climate changes, suggesting that “it is prudent for security analysts to expect climate surprises in the coming decade, including unexpected and potentially disruptive single events as well as conjunctions of events occurring simultaneously or in sequence, and for them to become progressively more serious and more frequent thereafter, most likely at an accelerating rate.”15 Despite the pervasive dysfunction of most governments in addressing “climate surprises” and other disaster vulnerabilities, we will no doubt see environmental risks beginning to shape the political expectations of senior officials and thought leaders. As in the Cold War or the current ”war on terror,” responsible policymakers must look not only to the familiar and most imminent threats but also to less likely but higher-impact scenarios that could be truly catastrophic for national security, particularly if sudden and unanticipated.16 Not unlike other threats to peace and security, the inability to predict with certainty the location and timing of future natural disasters should not obscure a nation’s vital interest in assessing their likelihood and potential aftereffects.

Local Catastrophes and Global Repercussions

The challenge is to envision plausible threats and sequential patterns of potential danger—not to scare people but to anticipate potential consequences and devise strategies to prevent or reduce economic, political, and social damage. The National Research Council suggests using analytical “stress” tests of particular countries or regions to envision the effects of major disasters, or clusters of disasters, even if some of them should be considered unlikely. History offers examples of catastrophes that illustrate the possible ripple effects from otherwise local disasters. The Lisbon earthquake, tsunami, and fire of 1755 destroyed that city and decisively degraded Portugal’s role as an imperial power.17 The Spanish flu epidemic of 1918–20 killed an estimated fifty million to one hundred million people worldwide and was particularly lethal among young adults, compounding the immense losses to that generation from World War I. More recently, the destruction from Hurricane Katrina on the U.S. Gulf Coast in 2005; the earthquake, tsunami, and nuclear shutdown in Fukushima, Japan in 2011; and Tropical Storm Sandy on the U.S East Coast in 2012 exposed the interconnected vulnerabilities of coastal settlements, energy infrastructures, health-care facilities, and large-scale relief and recovery operations—a complex combination for which neither the United States nor Japan was adequately prepared. Major localized disasters do not always result in irreversible setbacks. The Chicago Fire of 1871, the Boston Fire of 1872, and the San Francisco Earthquake of 1906 resulted in the major reconstruction of all three cities, making each of them more economically vibrant and resilient.18 New York will undoubtedly be better prepared after Sandy, as New Orleans was after Katrina when it faced Hurricane Isaac in August 2012. Yet both disaster specialists and mainstream media too often treat natural disasters as limited and local matters. Media focus has typically been more on immediate suffering than larger implications, direct effects than long-term consequences, and infrastructure repair than major institutional reforms. Nevertheless, as the number and scale of natural disasters increases, we are likely to witness growing public awareness and anxiety about the vulnerability of certain areas, which will become a strong political factor adding to the wider and longer-term consequences of disasters. Internet technologies will facilitate not only the rapid dissemination of distressing information about natural disasters and severe environmental conditions but also the potential for exaggerated predictions, political incitement, conspiracy theories, or even popular panic. Worst-case scenarios may then become urgent political focal points, especially those that illustrate the fragility of economic necessities, social cohesion, or public safety.19 Economic Cascades The most troubling scenarios of natural disasters involve those with simultaneous effects on major essentials: food, water, land, medicine, energy, or subsistence income. An overlapping series of earthquakes, floods, and food shortages affecting a megacity could overwhelm the capacity of national and international agencies to respond adequately. Other consequences could follow: The Fukushima nuclear meltdown, for example, led both the Japanese and German governments to announce the phasing out of their nuclear power industries—a major blow to any prospect of curbing global carbon emissions.20 Disruptive disasters in major food-producing regions could have dire global consequences. Corn, wheat, and rice crop failures would lead to price hikes and shortages in far-flung locations. The worldwide collapse of one of these major staples—for example, from a new fungal infestation in one region and a drought in another—could lead to famines, export cutoffs, stockpiling and hoarding, or cartelized supply arrangements. Such developments could create new zones of instability, hostility, and populist pretexts for aggressive steps to secure new supplies or assure future access. The drive to guarantee food sources has already prompted the governments of China, Korea, Saudi Arabia, and others to buy land in Africa and Latin America for growing food that could be diverted from global markets during shortages. Water shortages could be another cause of future conflicts. Recent intelligence analyses suggest that countries are unlikely to go to war over water,21 but the larger patterns of depletion and diversion—glacial melts in South Asia and the Andes; upstream dams in the Middle East, East Africa, and Southeast Asia; widening drought in sub-Saharan Africa—suggest that peacefully resolving some disputes over severe water shortages could be very difficult. The genocides in Rwanda and Darfur owed much to the pressures of land, food, and water competition in fomenting ethnic conflicts.22 Medicine can be another life-and-death necessity in times of emergency. It is not difficult to imagine that the government of a state facing the prospect of a deadly epidemic would take steps to seize or intercept supplies of essential medicines. After European and U.S. laboratories cloned the lethal H5N1 virus, Indonesia demanded access to the vaccine formulas to assure adequate supplies for its huge population at reasonable cost. A global pandemic from that virus or a similar microorganism could lead to travel restrictions, news blackouts, and other isolationist reactions, but also to more aggressive measures to obtain lifesaving medicine. Massive casualties could undermine the standard protocols of global cooperation among international and national agencies, reducing global effectiveness in containing disease.23 Natural disasters can also sever transportation and communication links and global supply chains—life lines for necessities—compounding the catastrophe where the disaster occurs and affecting employment even in distant locations. In 2011 both the Thai floods and the Japanese earthquake and tsunami disasters affected hard-disk and auto suppliers, causing factory shutdowns and end-product shortages on other continents. The volcanic dust cloud from Iceland in 2010 halted European air traffic for only a week or so but even then had significant effects on both business and tourism. Compare this with the massive 1883 eruption of Krakatoa and the 1815 eruption of Mount Tambora, both in Indonesia, which created longer-lasting effects around the world. The Tambora event led to what was then called “The Year Without a Summer,” because of the adverse effects on U.S. and European weather patterns.24 Social Collapse Major disasters can have social consequences when the intense stress of damage and recovery causes breaks along ethnic, religious, class, or geographic fault lines. A major earthquake in a megacity could produce violent confrontations among groups competing for scarce relief supplies and recovery assistance. Or the disaster might create reverse-urbanization pressures for millions of homeless and jobless people in suddenly uninhabitable slums. Once again, the purpose of discussing such scenarios is not to suggest that social chaos following a disaster is a given but rather to consider ways to prevent, or at least reduce, that possibility. The major quake that struck Mexico City in 1985 produced not widespread strife but inspiring solidarity in local relief and recovery operations, even among the poorest citizens.25 That city is now a prime candidate for even bigger quakes, affecting an even larger population. Joint planning for such a crisis by the United States and Mexico could reduce the possibility of greater casualties and infrastructure losses that might impel hundreds of thousands to seek entry into the United States. Sudden large-scale migrations are an increasing prospect among the effects of climate change. Low-lying islands, flood-prone coastal areas, large refugee camps, and regions of prolonged drought could provoke major population movements. The possibility of Bangladeshis pouring into India to escape delta flooding has already led the Indian government to construct a 4,000-kilometer fence to forestall such influxes. Mass migration from Africa to Europe could also result from the droughts and floods affecting an increasing number of areas. Within the continent, such forced movement could compound urbanization trends. Such cataclysms are unlikely to occur without violence.

Political Catalysts

Natural disasters can dramatically expose deep social inequities and government indifference or incompetence, fomenting opposition movements. In 1970, the government in western Pakistan responded so poorly to the cyclone that struck eastern Pakistan that it strongly contributed to the secession of what became Bangladesh. The Nicaraguan earthquake in 1972 fatally discredited the Somoza regime. The Myanmar government’s heartless response to Cyclone Nargis in 2008 was likely a further factor in the military regime’s political vulnerability and may have accelerated the recent transition there. An unprecedented drought in Syria from 2006 to 2010 disrupted agriculture in regions that then became strong supporters of the armed resistance.26 The rise in global food prices that began with a severe drought in Russia in the summer of 2010 was a key factor in provoking popular uprisings in various Arab states the following year.27 An earthquake and tsunami near Jakarta—40 percent of which is below sea level and frequently inundated by heavy rains—could render much of that city uninhabitable and set back Indonesia’s economic growth and democratic development for years. It could also reduce the country’s ability to cooperate on global issues, such as deforestation or pandemic prevention, on which its involvement has been crucial.28 An earthquake in Karachi or Delhi or a major flood in Mumbai or Lagos could cripple the economies of their respective countries and further degrade the effectiveness of government authorities to avoid serious ethnic, sectarian, or even international conflicts. Major deterioration of any one of these cities could undermine the stability of their respective regions, with direct economic and possibly military consequences for the United States. Weak governments or failed states lack the capacity to prevent even moderate disasters from becoming severe crises. For any of the above scenarios, it is insufficient for only government agencies to be aware or prepared. As the extent of global fragility in the face of natural disasters becomes more widely felt, the public may sense the start of a regional or even global slide toward scarcities of various kinds, leading to political pressures for more secure sources of necessities. Such pressures increase the risk of international confrontation and present opportunities for exploitation by terrorists, criminals, or fanatics who see increased mayhem as in their interest.29

Defensive Measures and Strategic Adjustments

Efforts to reduce the severity of natural disasters and contain their larger consequences will require three kinds of initiatives: stoic, heroic, and “ecozoic.”

Stoic Resilience

Humans continue to cope with natural disasters largely as they always have, by “weathering” them: riding out storms, putting out fires, waiting out droughts, and helping out their neighbors. The capacity of societies to withstand catastrophes is generally referred to as resilience. Such resilience depends on physical, economic, cultural, and political factors that determine a society’s ability to plan for and recover from disasters without creating major social and economic fallout. These capabilities are almost entirely the “stoic” achievements of local people—namely, doing what is necessary to survive and prosper in the places they inhabit. As with all preventive efforts, the benefits of investing in resilient infrastructure and sensible preparedness far outweigh the costs of coping with the consequences after disasters strike. Strong and enforced building codes; zoning restrictions in coastal areas; prepositioned shelters and supplies; accessible hospitals, clinics, and health workers; wellpublicized evacuation routes; and other aspects of public awareness all make a substantial difference in reducing casualties and damage. Media coverage can sometimes give the impression that those most affected by disasters depend mainly on responses from outsiders, but the reality in most cases is otherwise. People in the path of a natural event are almost always most effective in helping each other, comprising the overwhelming proportion of first and subsequent responders.30 However, the United States is neglecting a range of major domestic vulnerabilities to natural hazards that could have catastrophic consequences.31 Stephen Flynn has most ably summarized these and other ominous features of what he calls our “brittle nation.”32 The vulnerability of coastal developments along the Eastern seaboard, so tragically demonstrated during Tropical Storm Sandy, is one continuing danger. On the opposite side of the country, earthquakes present the more ominous threat. As Flynn recounts, the deteriorating earthen levees that currently protect the massive farmlands of California’s Central Valley are vulnerable to seismic effects. If seawater were to breach the levees after a major earthquake, it would contaminate one of the country’s most important food and employment sources for years to come. Prolonged heat waves and drought in the Midwest, even worse than those in 2012, could permanently devastate croplands and damage the country’s strained and outdated electrical grid. As the U.S. public health infrastructure continues to degrade, deadly epidemics could severely reduce national economic performance and shake citizens’ confidence in the competence and reliability of government at all levels. The current economic stress and political paralysis in the United States complicate the country’s physical vulnerabilities. Debt levels and ongoing deficits substantially reduce the capacity of government agencies at all levels to address infrastructure and preparedness investments that reduce disaster risks. In 2012, even normally routine federal appropriations for disaster relief after Sandy became a political football.33 While most investments in community resilience, as well as in industrial and agricultural facilities, are state and local matters, congressional gridlock on many major issues indicates the difficulty that new assertions of federal authority or leadership would face in directing infrastructure changes or restricting flood zone settlements. The domestic vulnerabilities of the United States are further compounded by the global risks to vital U.S. interests resulting from the vulnerabilities of critical infrastructure and large populations around the world. While national development strategies increasingly emphasize “disaster risk reduction” and “sustainable economies”34 and certain countries, such as Bangladesh, Vietnam, and Mozambique, have successfully lowered their casualty rates from recurrent flooding through better preparedness and infrastructure changes, their examples are not widely imitated. Even their successes may be overwhelmed eventually by the expected scale of storms and ocean surges. Ethiopia and Rwanda have implemented food security policies that have increased their ability to cope with drought and other environmental challenges. But despite initiatives such as the U.S. Agency for International Development’s (USAID) Feed the Future program, the global prospects for substantial increases in food production are uncertain at best. Worldwide expenditures on health care, including infrastructure and training, experienced an exceptional increase over the last decade, especially from the U.S. government. However, both health and agricultural improvements depend on continued donor assistance, which has already fallen significantly since the global recession.35 Most fundamental to stoic readiness is the political capacity of societies to mobilize in the face of crises. Such capacity includes the ability to make decisions quickly and cohesively, to redirect funding rapidly without corruption, and to deliver supplies and support efficiently. Even effective democratic governments, such as those of Turkey or Indonesia, might find regional, ethnic, or religious diversity becoming a source of conflict in the wake of a massive natural disaster. More troubled federal polities, such as Pakistan or Nigeria, could unravel, although Pakistan has handled three successive seasons of massive flooding with remarkable resilience. In failed or failing states, government capabilities are especially lacking, and such political capacity is the most difficult set of skills and institutions to improve, even with major development assistance from outsiders.36 International organizations and financial institutions increasingly promote disaster risk reduction. Both the World Bank and the agencies of the UN system, led by the United Nations Development Programme, advocate investments that increase resilience to environmental challenges. But the resources to back up these recommendations are not commensurate. For example, under the impetus of the 1997 Kyoto Protocol on climate change, an adaptation fund to assist with risk reductions was initiated in 2001. But that fund was not actually launched until 2007, and despite the creation of a similar green climate fund at the Copenhagen climate change summit in 2009, both initiatives remain woefully underfunded—as highlighted in the latest global gathering on climate change in Doha.37 With a huge imbalance between growing global risks to large populations and declining investments in resilience, U.S. leaders will be forced to make difficult choices. U.S. policies on development assistance will likely have to adopt a form of preventive triage, placing scarce assistance dollars where they will have the most enduring effects on resilience and adjustment, rather than where the needs of poverty reduction and other objectives of the UN’s Millennium Development Goals (MDGs) might otherwise seem greatest. Already the efforts to set a new agenda for development after the deadline for the MDGs in 2015 include some recognition of the need for a more pragmatic view of sustainability. But as with the MDGs, the political dimensions of resilience continue to receive little emphasis in current drafts of these global manifestos.

Heroic Relief

Increased resilience must be matched with enhanced capabilities for effective relief. Improving the scale and effectiveness of assistance to the victims of disasters is an essential priority not only for limiting immediate effects but also for containing political fallout. In the United States, specialized national agencies, such as the Federal Emergency Management Agency (FEMA) and the American Red Cross, are the principal organizers of emergency support, supplemented by state-level agencies, the National Guard, and countless local and national non-governmental organizations (NGOs).38 Since Hurricane Katrina in 2005, all these actors have demonstrated improved capacities to deal with storms, even as available resources for future crises are in decline. Most other developed countries have similar, though mainly national, agencies to lead relief operations. In poorer countries, capacities are more variable, often either completely localized or highly dependent on national military agencies, as evidenced during the 2004 tsunami in the Indian Ocean. The National Disaster Management Authority of Pakistan, in its response to the massive floods of 2010 and 2011, has been one of the notable civilian exceptions. Assistance to the most at-risk countries to increase their own capacity for humanitarian relief should be a donor priority. Resources for humanitarian assistance from national donor agencies have seen major growth in the past twenty years. In the United States, funding for foreign disaster assistance has had strong bipartisan support in Congress for many years, and humanitarian relief resonates strongly with large portions of the U.S. electorate. The Office of Foreign Disaster Assistance (OFDA) within USAID has had a record of operational excellence and effectiveness. Other governments also have made international humanitarian assistance a high priority. Scandinavian ministries, the United Kingdom’s Department for International Development (DFID), and the European Commission’s Solidarity Fund have been especially generous contributors to relief operations in recent times, both directly and through UN agencies. The role of major international NGOs, corporate philanthropy, and foundations has also grown, with resources that sometimes exceed those from official sources. With the expansion of heroic generosity, the delivery of disaster assistance has become a major international industry. Large companies and suppliers sell their goods and services in the wake of each major event. NGOs similarly follow devastation and suffering from place to place. Many take advantage of public attention and sympathy for disaster victims to raise large amounts of money for relief. However, the effectiveness of relief operations, and especially the transition from relief to recovery, often has been less than optimal. Repeated proposals have been made to create a more centrally coordinated system, and UN agency leaders have made major advances over the past two decades in coordinating and funding major international relief operations. In 1991, the General Assembly created an Inter-Agency Standing Committee (IASC) of UN agencies, a Central Emergency Revolving Fund (CERF), and an Emergency Relief Coordinator (ERC) within the UN secretariat. The latter evolved by the end of the 1990s into the Office for the Coordination of Humanitarian Affairs (OCHA), headed by the ERC with the rank of under-secretary-general. In 2005, following the Indian Ocean tsunami, IASC members agreed on an intensified approach to collaboration, dubbed the “cluster system,” which divided relief operations into major functional components and designated lead agencies in each sector to coordinate the work of both international organizations and NGOs. The current ERC, Valerie Amos from the United Kingdom, has undertaken further efforts to improve the performance of the relief community, in the process raising billions of dollars through consolidated appeals, including urgent “flash appeals” to donors. The January 2010 earthquake in Haiti, which received huge publicity and donations, highlighted both the best and worst features of the international cluster system—and of heroic relief efforts in general.39 Assistance followed a familiar pattern of initial energy and compassion that dissipated once the atmosphere of emergency and improvisation shifted to the long-term demands for major reconstruction and local government control. The influx of supplies and aid workers during the first year of relief was overwhelming. One year later, agencies reluctantly faced the need to shift their promises from “building back better” (as former President Clinton likes to put it)40 to the harsher choices involved in satisfying donors that their resources were accomplishing more immediate concrete effects. Addressing short-term basic human needs for water, food, and shelter—often to people living in large tent cities—is a different task from that of rebuilding basic infrastructure, restarting large and small businesses, and forging political institutions that endure after agencies depart. As all too often happens, the initial humanitarian response to Haiti was overly romantic, inconsistent, and insufficiently attuned to the unique features of the local culture, economy, and political system.41 With intense economic pressures on virtually all major donors, disillusionment with relief operations may result in political pressures to reduce assistance. Popular support for even the most sympathetic causes may begin to wither, including among generous Americans, especially if foreign crises multiply, or if the U.S. homeland itself is struck by major natural disasters that divert attention and resources to domestic priorities. The multilateral institutional cushions needed to mitigate the social, economic, and political fallout from extreme events remain ad hoc and undeveloped. G-8 and G-20 summit agendas pay some attention to these issues but with little evident follow-through from national governments.42 The UN Security Council, despite one famous session to address the security implications of HIV/AIDs in early 2000, has been erratic and unfocused in dealing with the broader security challenges of disease and disasters. As the council is the principal global institution responsible for addressing international “threats to the peace,” such neglect will need to be remedied. International financial institutions have standard approaches for assisting with disaster recovery, such as the emergency response programs of regional development banks, as well as the World Bank’s Emergency Recovery Loan program, Hazard Management Unit, and Global Facility for Disaster Reduction and Recovery (GFDRR). The International Monetary Fund has an emergency assistance facility designed to ease the fiscal effects of major disasters.43 But these economic mechanisms are not scaled for the size of the challenges ahead, and the international diplomatic and intelligence channels needed to address urgent political and security risks are relatively undeveloped. Even the example of the successful global efforts led by the World Health Organization in responding to pandemic threats from the SARS and avian flu viruses may not prevent national budget cuts in preventive and public health capacity.44 The same budgetary fate could befall otherwise promising initiatives to reduce food insecurities, such as those which the G-20 governments have endorsed. The international community deserves great credit for its recent heroic efforts to aid societies affected by natural disasters. But it is highly unlikely that multilateral relief operations are prepared to work at the necessary scale when disaster incidents multiply. As with future investments in resilience, some form of priority setting or triage may become the imposed standard for major international relief as well. Ecozoic Relocation Even the most effective combination of stoic and heroic efforts will not sustain vulnerable populations indefinitely. As sea levels and storm surges continue to rise, as key fisheries are contaminated or extinguished, as certain regions become inhospitable to agriculture, or as earthquakes or epidemics degrade the capacity of megacities to provide for their citizens, some currently inhabited parts of the planet will have to be scaled back, or even abandoned, for large-scale settlement. Particularly if global warming trends fulfill some scientific projections, the planet may impose wholesale and dramatic adjustments to the locations, dimensions, and lifestyles of human settlements on a scale akin to the major migrations imposed by ancient ice ages. Anticipating future adaptations of this magnitude, some scientists and philosophers have begun to refer to a coming “ecozoic” age of human adaptation.45 In the United States, such speculation will likely surface initially as more intense versions of familiar controversies over development or rebuilding in coastal areas or floodplains. These issues involve decisions about zoning, taxes, subsidized flood insurance,46 and the various publicly funded programs that promote or sustain coastal growth, such as beach reclamation or the building of wave barriers and dikes.47 Developers and local politicians often downplay disaster risks and the pressures from local citizens are almost always to rebuild rather than to abandon or relocate. Yet even the most stoic impulses must confront difficult choices. New Orleans is a prominent case in point regarding resettlement and reconstruction in areas prone to further flooding, such as the lower Ninth Ward. Hurricane Isaac demonstrated that the huge post-Katrina investments in floodwalls and levies involved decisions to protect certain areas at the expense of others. Such choices now confront officials and citizens on the Jersey Shore, Staten Island, and Long Island in the wake of Tropical Storm Sandy. The same issues will be replicated around the world. Government subsidies for hazard insurance or expensive engineering for stopgap measures, such as dikes, imported water supplies, or beach reclamation, will at some point no longer protect exposed populations enough to justify the resources needed to maintain them. As media coverage and public discussion increasingly focus on the most exposed areas, many people will begin to vote with their feet and look to resettle their families and businesses in areas less exposed to the hazards they witness across the globe. Real estate prices and infrastructure investments will increasingly reflect the realities of that new marketplace. Obvious areas of special exposure already justify “exit strategies” or migratory transitions. The former president of the Maldives, Mohamed Nasheed, has become a prominent spokesman for the fundamental threats of sea level increases to small island states.48 In other exposed areas—such as low-lying estuaries of Bangladesh, Burma, and Vietnam, as well as large areas of Africa—desertification, erosion, or salinization could render agriculture or adequate supplies of potable water infeasible. Water shortages may make areas of Central Asia and the Middle East impractical for continued settlement. On an even larger scale, some experts suggest that the expected growth of certain megacities will reach practical ceilings because of the physical and economic limitations of distributing food and water.49 Major epidemics could accelerate these pressures to limit or reduce some urban populations. The political and social dimensions of massive shifts in environment and population are difficult to predict, but the likelihood is that over time large groups of people will become ecologically displaced persons or “environmental refugees,” forced from their historic homelands and needing relocation to more hospitable places within or beyond national boundaries.50 Such transitions will present large political and economic challenges, both for long-term humanitarian support and for immigration laws and enforcement. If these movements involve millions of desperate people, geographic and political boundaries will become increasingly problematic. Recommendations: National Security and Global Solidarity The incidence of military conflicts between states is at a historic low; even the number of conflicts within states has declined steeply since the twentieth century.51 However, both trends could be slowed or reversed by increased vulnerabilities to natural disasters and the limits of political and economic capacity to deal with them. How should the challenges ahead be framed in terms of U.S. national security and the larger “threats to the peace”?

Citizen Safety Most governments place their highest priority on national security, which begins with ensuring the physical safety of their citizens, or as John Jay famously put it in The Federalist: “Among the many objects to which a wise and free people find it necessary to direct their attention, that of providing for their safety seems to be the first.”52 While they are used to thinking of such safety in terms of protection from attacks by military or terrorist adversaries, Americans also regard their fundamental security as dependent on access to reliable supplies of air, water, food, medicine, and shelter.53 All would likely place these subsistence needs above any threat currently on the horizon, foreign or domestic. However, it is leaders—thought leaders as well as political leaders—who define the priorities for government policy and expenditures in dealing with what they perceive as the greatest threats to the country and its citizens. Such definitions of national security generally arise as narratives developed in the course or aftermath of major international attacks or threats of attack. Historical turning points in these narratives over the last hundred years include, for example, the German attacks on U.S. shipping that provoked the country into World War I; the Japanese attack on Pearl Harbor that plunged the United States into World War II; the Berlin crisis, Korean War, and Soviet nuclear tests that intensified the Cold War; and the September 11, 2001, attacks that provoked the U.S. War on Terror. Whether or not all Americans agreed with the security rationales their leaders offered at those times, they provided bold assessments of the threats confronting the country, which gained wide acceptance. Each narrative was a necessary, and apparently sufficient, political basis to enlist political support for executive orders, policies, legislation, appropriations, treaties, and other international commitments that were consistent with the leaders’ justifications. At present there is no reasonable prospect that U.S. leaders would create a national security narrative focused on the cumulative threats from an overstressed planet.54 To mobilize popular support for the major initiatives necessary to reduce foreseeable risks, U.S. leaders would eventually have to shift their characterizations of such threats from environmental to existential and from futuristic (after 2050) to imminent (before 2020). That shift is unlikely until Americans experience a pattern of severe crises that would shift popular perceptions and political attitudes in decisively different directions. No one wants to contemplate the horrific disasters that might drive such a shift in attitudes, especially when the destruction from Katrina and Sandy seem not to have had such an effect on most political leaders. Political resistance to the recognition of these likely threats is reinforced by a suspicion that those who highlight them are also seeking to justify major government interventions and expenditures, involving severe changes in lifestyles. References to global warming, or even to obvious climate changes, sound to some audiences as code words to justify carbon caps and oil taxes. Therefore this report assumes that such mitigation programs are not foreseeable in time to avoid the climatic, economic, and demographic consequences of current trends. Indeed, it is because these trends will not be changed in time that steps must be taken to adapt to their likely effects. U.S. political and thought leaders need to fulfill their highest responsibility—for the safety of citizens—by beginning to consider a range of risk reduction policies, infrastructure investments, and preparedness strategies, including the necessary legislative and budgetary changes, that might constitute an approach to national security aimed at reducing the direct and secondary consequences of natural disasters. Whether or not the necessary stoic and heroic steps are all politically palatable, the larger arguments for them should at least be actively under current debate. As Stephen Flynn has emphasized, most of these steps would not only reduce U.S. vulnerability to extreme natural events but would also reduce the opportunities for terrorists to exploit the same vulnerabilities.55 How these competing political pressures will play out depends not only on the timing and locations of disasters but also on how soon the growing public perception of our vulnerabilities becomes a political reality. The combination in 2012 of major tornados, midwestern drought, Texas floods, Hurricane Isaac, western wildfires, Arctic ice depletion, and Tropical Storm Sandy could mark the beginning of a sea change in the electorate’s expectations of present and future exposure to natural disasters. In that event, the hardest challenge for U.S. leaders may well be to prevent the country from turning inward to focus on domestic priorities and resisting involvement in the crises of other countries or regions. Such isolationism could be expressed through intensified calls for energy independence, food selfsufficiency, foreign assistance cutoffs, and even military retrenchment. Reversing decades of generosity and pragmatism, donor fatigue and domestic needs could generate a new version of an “America First” constituency that opposes all such international engagement and punishes at the polls any politician who supports it. Collective Containment U.S. leaders also cannot ignore the national security implications of the most serious risks of disaster beyond our borders. The safety of U.S. citizens is inextricably bound through the global economy with the course of environmental events in other parts of the world. Disasters or extreme conditions that degrade major agricultural areas (Russian, Australian, or Argentinean wheat fields, Japanese, Burmese, Philippine rice), disrupt for prolonged periods key manufacturing, transportation, or communications infrastructure (greater Bangkok, Bosporus, European airspace), or create immense casualties among large stressed populations (pandemics in Pakistan, Brazil, Nigeria) could affect the stability of entire regions. The severe degradation of a megacity could snowball into wider instability and conflict if not managed collaboratively. The sooner and more deliberately U.S. leaders can articulate geographic, cultural, or economic justifications for targeting scarce assistance, the sooner they are to be persuasive to U.S. citizens. Political preparation is equally required of other governments and populations. If disasters multiply, U.S. influence with these countries will likely depend on the level of U.S. engagement, generosity, and leadership in promoting a sense of global solidarity through an agenda for collaboration on resilience, relief, and relocation options. For this purpose, the U.S. government will need to complement its domestic security rationale with a compelling diplomatic narrative that advocates the needs and priorities for dealing with events that might otherwise spark major confrontations. The alternative could well be aggressive measures by governments, desperate for necessities, to bypass market allocations or seize supplies by intercepting transports, deploying covert operations, or even initiating outright invasions. A series of functionally focused collaborations to identify and manage key risks could be indispensable to contain the political consequences of future extreme events. Whether the Security Council, the G-20, the World Health Organization, or some new or combined political coalition would be the locus for such negotiated understandings is unclear. But the likelihood is that all international institutions will have to elevate their focus and resources to address disaster scenarios and environmental vulnerabilities. The security agendas of politicians, policymakers, and intelligence personnel will likely be distracted, for the time being, by perceived dangers from rogue states armed with nuclear weapons, failed states and ungoverned areas as safe havens for terrorists, and economic criminals, such as cyberburglars, unfair traders, and intellectual property thieves. Meanwhile, the safety and prosperity of the United States, as well as peace throughout the world, increasingly will be endangered by unaddressed vulnerabilities to natural disasters and extreme environmental crises. Contention and conflict could also result from the sudden realization—or opportunistic exaggeration—among large groups of alarmed citizens that such vulnerabilities are both existential and irreversible. Given demographic and environmental trends, and the increasing vulnerabilities and probable shortages to be expected within this decade—and certainly before 2030—the threats to the peace from Mother Nature may soon come to dwarf any of the threats posed by mere mortals.

### Case

#### Starlink is a service that’s contracted out to public entities so no private appropriation is involved – their own ev – we read blue

Bernat 19 “The Inevitability of Militarization of Outer Space” Paweł Bernat [Assistant Professor, Polish Air Force University] Safety & Defense 5(1) (2019) 49–54 <https://philarchive.org/archive/BERTIO-52> SM

Another example is the mentioned already Starlink system that will provide broadband internet for the Northern US and parts of Canada already in 2020, and the plan is to create the global system before 2027 (Mosher, 2019). Again, the system, although designed for civil purposes, will be used by the military – the US Air Force is testing SpaceX’s Starlink technology in military aircraft to deliver high bandwidth into the cockpit of Air Force planes under a program called Global Lightning (Malik, 2019). The facts are straightforward – there are more and more satellite systems that play an essential role in countries’ security and are part of critical infrastructure, so in order to secure their interests and protect that infrastructure, these national states keep developing both defensive and offensive means. The Worldwide Threat Assessment of the US Intelligence Community is very clear in its predictions in this regard:

#### More lines from their evidence

Song and Bloom 20 “Big Tech is leading the new space race. Here's why that's a problem” Steve Song is a Fellow with the Mozilla Foundation where he works to promote policy and regulation that will increase equitable and affordable access to communication in rural and underserved regions of the world. Peter Bloom is a community digital defense activist and the founder and General Coordinator of Rhizomatica, an international non-profit that helps communities build their own communications infrastructure. He is a former Shuttleworth Foundation fellow and was named an Innovator under 35 by MIT Technology Review and appeared on Foreign Policy's 100 Leading Global Thinkers list in 2015. November 14, 2020 <https://www.salon.com/2020/11/14/big-tech-is-leading-the-new-space-race-heres-why-thats-a-problem/> SM

It is necessary to better understand the deep ties of LEO companies to the hegemonic designs of national governments on near space. Recently, in exchange for $28 million USD, Starlink provided the services of its satellites for live-fire demos with the US Air Force to test its Advanced Battle Management System and lay the groundwork for a military Internet of Things. Speaking after the latest live-fire demo, William Roper, Air Force acquisition chief, opined that "the military needs to be ready to play a strategic role because we need communications in many areas of the world that there are no commercial providers . . . we can be the stability case for companies like SpaceX and others who want to sell communications worldwide."

SpaceX's connections to the military-industrial complex were made clear in comments by SpaceX president Gwynne Shotwell in 2018, who stated that her company would be willing to launch a space weapon to protect the US, in contravention of established space norms. Only weeks ago, SpaceX signed a contract with the Pentagon to jointly develop a rocket that can deliver up to 80 tons of cargo and weaponry anywhere in the world in just one hour.

#### Starlink ACA systems and de-orbiting solves any debris impact – Russian ASAT test proves and also non-uniques their impact

Kan 21 – [Michael, “Starlink Satellite Orbits Changed to Avoid Debris After Russia's Missile Test,” PC Mag, 12/1/2021, https://www.pcmag.com/news/starlink-satellite-orbits-changed-to-avoid-debris-after-russias-missile]

SpaceX has altered the orbits for its Starlink satellites, likely to prevent them from colliding with debris from Russia’s anti-satellite missile test.

On Tuesday, SpaceX CEO Elon Musk mentioned the issue after NASA abruptly delayed a spacewalk on the International Space Station due to the threat of space debris. In his tweet, Musk said: “We had to shift some Starlink satellite orbits to reduce probability of collision. Not great, but not terrible either.”

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

Last month, the US was quick to condemn Russia’s anti-satellite missile test, which involved the Kremlin sending up a missile to destroy one of its own defunct satellites. The ensuing impact caused hundreds of thousands of pieces of debris to spill out into orbit, according to the US.

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

However, Russia claims the resulting debris poses no danger to any space activity. The Kremlin also points out other countries have embarked on their own anti-satellite missile tests too.

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

In his tweet, Musk added that the International Space Station and SpaceX’s own Dragon craft possess “micrometeorite shields,” which can withstand high-velocity impacts. However, spacesuits lack such protection, hence the need for NASA to cancel the spacewalk.

#### Low altitude orbits zeroes risk of collision and doesn’t contribute to overall debris in dense areas – even if satellites fail no impact

Grush 18 – [Loren, “SpaceX wants to fly some internet satellites closer to Earth to cut down on space trash,” 10/9/2018, <https://www.theverge.com/2018/11/9/18016962/spacex-internet-satellites-space-debris-trash-orbit-closer-earth-distance-atmosphere>]

SpaceX is revising its satellite internet initiative, Starlink, and it now hopes to operate some of its spacecraft at a lower altitude than originally planned. In a new filing to the Federal Communications Commission (FCC), SpaceX is asking the agency to modify its license so that more than 1,500 Starlink satellites can operate at an altitude 600 kilometers lower than the company originally requested.

SpaceX argues that this change will make the space environment safer, as it will be easier to get rid of these satellites at this new altitude when they run low on fuel or can no longer function properly in orbit. This update could also explain the unexpected behavior of two of SpaceX’s test satellites for Starlink, which have remained in lower orbits than expected.

Back in March, the FCC approved SpaceX’s license for the first phase of its ambitious Starlink initiative — the company’s long-term plan to launch nearly 12,000 satellites into orbit to beam internet coverage down to Earth. Initially, SpaceX asked the FCC for permission to launch 4,425 satellites into orbits ranging between 1,110 to 1,325 kilometers high. But with this new filing, SpaceX is requesting that 1,584 of those satellites, which were supposed to operate at 1,110 kilometers, be allowed to operate at 550 kilometers instead.

SpaceX says moving the satellites to a lower altitude means it can do more with less. Originally, the company said it needed 1,600 satellites to operate at the 1,110-kilometer altitude, but moving them lower means the company can get the same results with 16 fewer spacecraft. And the lower altitude makes it easy to dispose of these satellites once they’re done in space. At this height, particles from Earth’s atmosphere bombard the spacecraft more rapidly, pushing them out of orbit and dragging them down to the planet. And on the way down, they burn up in the atmosphere.

Making sure these spacecraft come out of orbit in a timely manner is crucial because of the vast number of vehicles that SpaceX wants to put into orbit. A constellation the size of Starlink could dramatically increase the number of operational satellites in space, raising the risk of in-space collisions. A recent NASA study argued that 99 percent of these satellites will need to be taken out of orbit, reliably, within five years of launch, or the risk of satellite collisions goes up quite a bit.

De-orbiting a satellite typically entails bringing the vehicle to a low enough altitude with thrusters where Earth’s air particles and gravity drag the probe down so that it burns up. Now, with this new filing, SpaceX won’t have to significantly move 1,584 of its satellites to get rid of them. The atmosphere at 550 kilometers should do the job within a few years. That’s also helpful in case the spacecraft fails in orbit. Satellites that fail in higher altitudes could turn into unoperational space debris that stay in orbit for long periods of time. At lower altitudes, they can still fail, and the atmosphere will still swallow them up in a timely manner.

#### The ozone layer doesn’t matter – empirical ozone holes solve

**Ridley 14** [Matt, DPhil from Oxford, Fellow of the Academy of Medical Sciences, The Times, September 15, 2014, “The ozone hole isn’t fixed. But that’s no worry,” http://www.thetimes.co.uk/tto/opinion/columnists/article4206440.ece]

How much damage did the ozone hole ever threaten to do anyway? It is fascinating to go back and read what the usual hyperventilating eco-exaggerators said about ozone thinning in the 1980s. As a result of the extra ultraviolet light coming through the Antarctic ozone hole, southernmost parts of Patagonia and New Zealand see about 12 per cent more UV light than expected. This means that the weak September sunshine, **though it feels much the same**, has the power to cause sunburn more like that of latitudes a few hundred miles north. **Hardly Armageddon**. The New York Times reported “an increase in Twilight Zone-type reports of sheep and rabbits with cataracts” in southern Chile. Not to be outdone, Al Gore wrote that “hunters now report finding blind rabbits; fisherman catch blind salmon”. Zoologists briefly blamed the near extinction of many amphibian species on thin ozone. Melanoma in people was also said to be on the rise as a result. **This was nonsense**. Frogs were dying out because of a fungal disease spread from Africa — nothing to do with ozone. Rabbits and fish blinded by a little extra sunlight proved to be as mythical as unicorns. An eye disease in Chilean sheep was happening outside the ozone-depleted zone and was caused by an infection called pinkeye — nothing to do with UV light. And melanoma incidence in people actually levelled out during the period when the ozone got thinner. Then remember that the ozone hole appears when the sky is dark all day, and over an uninhabited continent. **Even if it persists into the Antarctic spring and spills north briefly, the hole allows 50 times less ultraviolet light through than would hit your skin at the equator at sea level** (let alone at a high altitude) in the tropics. So it would be bonkers to worry about UV as you sailed round Cape Horn in spring, say, but not when you stopped at the Galapagos: the skin cancer risk is 50 times higher in the latter place.

#### No ozone impact

**Ridley 14** -- Matthew White Ridley, 5th Viscount Ridley DL FRSL FMedSci, known commonly as Matt Ridley, is a British journalist, businessman and author of popular science books. Since 2013 Ridley has been a Conservative hereditary peer in the House of Lords. “THE OZONE HOLE WAS EXAGGERATED AS A PROBLEM” http://www.rationaloptimist.com/blog/the-ozone-hole-was-exaggerated-as-a-problem.aspx

Serial hyperbole does the environmental movement no favours My recent Times column argued that the alleged healing of the ozone layer is exaggerated, but so was the impact of the ozone hole over Antarctica: The ozone layer is healing. Or so said the news last week. Thanks to a treaty signed in Montreal in 1989 to get rid of refrigerant chemicals called chlorofluorocarbons (CFCs), the planet’s stratospheric sunscreen has at last begun thickening again. Planetary disaster has been averted by politics. For reasons I will explain, this news deserves to be taken with a large pinch of salt. You do not have to dig far to find evidence that the ozone hole was never nearly as dangerous as some people said, that it is not necessarily healing yet and that it might not have been caused mainly by CFCs anyway. The timing of the announcement was plainly political: it came on the 25th anniversary of the treaty, and just before a big United Nations climate conference in New York, the aim of which is to push for a climate treaty modelled on the ozone one. Here’s what was actually announced last week, in the words of a Nasa scientist, Paul Newman: “From 2000 to 2013, ozone levels climbed 4 per cent in the key mid-northern latitudes.” That’s a pretty small change and it is in the wrong place. The ozone thinning that worried everybody in the 1980s was over Antarctica. Over northern latitudes, ozone concentration has been falling by about 4 per cent each March before recovering. Over Antarctica, since 1980, the ozone concentration has fallen by 40 or 50 per cent each September before the sun rebuilds it. So what’s happening to the Antarctic ozone hole? Thanks to a diligent blogger named Anthony Watts, I came across a press release also from Nasa about nine months ago, which said: “ Two new studies show that signs of recovery are not yet present, and that temperature and winds are still driving any annual changes in ozone hole size.” As recently as 2006, Nasa announced, quoting Paul Newman again, that the Antarctic ozone hole that year was “the largest ever recorded”. The following year a paper in Nature magazine from Markus Rex, a German scientist, presented new evidence that suggested CFCs may be responsible for less than 40 per cent of ozone destruction anyway. Besides, nobody knows for sure how big the ozone hole was each spring before CFCs were invented. All we know is that it varies from year to year. How much damage did the ozone hole ever threaten to do anyway? It is fascinating to go back and read what the usual hyperventilating eco-exaggerators said about ozone thinning in the 1980s. As a result of the extra ultraviolet light coming through the Antarctic ozone hole, southernmost parts of Patagonia and New Zealand see about 12 per cent more UV light than expected. This means that the weak September sunshine, though it feels much the same, has the power to cause sunburn more like that of latitudes a few hundred miles north. Hardly Armageddon. The New York Times reported “an increase in Twilight Zone-type reports of sheep and rabbits with cataracts” in southern Chile. Not to be outdone, Al Gore wrote that “hunters now report finding blind rabbits; fisherman catch blind salmon”. Zoologists briefly blamed the near extinction of many amphibian species on thin ozone. Melanoma in people was also said to be on the rise as a result. This was nonsense. Frogs were dying out because of a fungal disease spread from Africa — nothing to do with ozone. Rabbits and fish blinded by a little extra sunlight proved to be as mythical as unicorns. An eye disease in Chilean sheep was happening outside the ozone-depleted zone and was caused by an infection called pinkeye — nothing to do with UV light. And melanoma incidence in people actually levelled out during the period when the ozone got thinner. Then remember that the ozone hole appears when the sky is dark all day, and over an uninhabited continent. Even if it persists into the Antarctic spring and spills north briefly, the hole allows 50 times less ultraviolet light through than would hit your skin at the equator at sea level (let alone at a high altitude) in the tropics. So it would be bonkers to worry about UV as you sailed round Cape Horn in spring, say, but not when you stopped at the Galapagos: the skin cancer risk is 50 times higher in the latter place. This kind of eco-exaggeration has been going on for 50 years. In the 1960s Rachel Carson said there was an epidemic of childhood cancer caused by DDT; it was not true — DDT had environmental effects but did not cause human cancers.

#### Nuclear plants are resilient

* New reactor technology is resilient
* NERC concluded shut downs for power plants are possible during a major EMP event

Conca 19 [James Conca, pHd, expert on energy, nuclear and dirty bombs, a planetary geologist, and a professional speaker, “Can Nuclear Power Plants Resist Attacks Of Electromagnetic Pulse (EMP)?”, 1/3/19, <https://www.forbes.com/sites/jamesconca/2019/01/03/can-nuclear-power-plants-resist-attacks-of-electromagnetic-pulse-emp/#689dec8270cb>]

Yes. Specifically, the small modular nuclear reactor company, NuScale, out of Oregon, has made their reactor resistant to electromagnetic pulses (EMP) and most other reactor designs should follow.

EMPs are one of those things that many people think is fake, or over-blown, or a conspiracy theorist’s dream. But they are real. EMPs can be either natural, from things like extreme solar geomagnetic disturbances, or man-made like a large thermonuclear detonation or a cyberattack. If they are coordinated with physical attacks then things can get real dicey real fast.

As the U.S. Commission to Assess the Threat to the United States from EMP Attack points out, “the physical and social fabric of the United States is sustained by a system of systems - a complex and dynamic network of interlocking and interdependent infrastructures whose harmonious functioning enables the myriad actions, transactions, and information flow that undergird the orderly conduct of civil society.”

According to the Commission, EMP effects represent arguably the largest-scale common-cause failure events that could affect our electric power grid and undermine our society, leaving it vulnerable on many fronts. High-voltage control cables and large transformers that control the grid are particularly vulnerable. Transformers weigh 400 tons, take two years to build, and cost $7 million apiece. We are already way behind in having backup transformers ready, so if many go out at once, we have a big problem powering our country.

So can we do anything about it?

The phenomenon of a large electromagnetic pulse is not new. The first human-caused EMP occurred in 1962 when the 1.4 megaton Starfish Prime thermonuclear weapon detonated 400 km above the Pacific Ocean.

One hundred times bigger than what we dropped on Hiroshima, Starfish Prime resulted in an EMP which caused electrical damage nearly 900 miles away in Hawaii. It knocked out about 300 streetlights, set off numerous burglar alarms, and damaged a telephone company microwave link that shut down telephone calls from Kauai to the other Hawaiian islands.

And that was from 900 miles away.

On the natural side, in 1989, an unexpected geomagnetic storm triggered an event on the Hydro-Québec power system that resulted in its complete collapse within 92 seconds, leaving six million customers without power. The storm resulted from the Sun ejecting a trillion-cubic-mile plume of superheated plasma, or ionized gas.

It took two days for this cloud to smash into the Earth’s magnetosphere overwhelming its normal ability to throw off charged cosmic particles, triggering hundreds of incidents across the globe and causing undulating, multicolored auroras to spread as far south as Texas and Cuba.

Such storms occur every 60 years or so, and in 1989, we weren't anywhere near as electrified and electronically interconnected as we are today, or as we will be in 30 years.

This is the most likely EMP to occur.

A new 2018 study by the U.S. Air Force Electromagnetic Defense Task Force addresses direct EMP threats to the United States and its allies. While some issues have existed for decades, the window of opportunity to mitigate some of these threats is closing. Meanwhile, many existing threats have gained prominence because of the almost universal integration of vulnerable silica-based technologies into all aspects of modern technology and society.

In 2008, the Commission to Assess the Threat to the United States from Electromagnetic Pulse Attack made a compelling case for protecting critical infrastructures against EMP and solar geomagnetic disturbances. To avert long term outages, the U.S. must assure the availability of survivable power sources with long-term, readily accessible and continuous fuel supplies to blackstart the grid, sustain emergency life-support services, and reconstitute local, state, and national infrastructures. Long term outages are defined as the interruption of electricity for months to years over large geographic regions.

An eye-level point-of-view rendering from inside the NuScale plant visitor’s center looking toward the plant facilities. The plant design guards against EMPs, meltdowns and cyberattacks, and can provide energy continuously through any disaster.NUSCALE

The Nuclear Regulatory Commission tracks this issue closely, and has been examining these issues for more than 30 years, starting in the late 1970s when the agency studied how EMP could affect nuclear power plant safe-shutdown systems. The agency concluded as recently as two years ago that nuclear power plants can safely shut down following an EMP event. NRC drafted a rule last year on maintaining key plant safety functions after a severe event, particularly on how to keep spent fuel pools cool.