## Off

### 1

#### Counterplan Text: The appropriation of outer space by private entities is unjust, sans mining expeditions.

#### Private space companies are the leading drivers of mining resources off celestial bodies – that’s key to stop resource, water, and rare earth mineral shortages

Gilbert 21 (Alex Gilbert; 4/26/21;The Milken Institute Review; *“Mining in Space Is Coming”*; accessed 12/15/21; <https://www.milkenreview.org/articles/mining-in-space-is-coming>; alex gilbert, is a complex systems researcher and a PhD student in space resources at the Colorado School of Mines.) HB

As every fan of science fiction knows, the resources of the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). Visionaries including Jeff Bezos imagine heavy industry moving to space and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and governance. Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models. That said, there’s no grass growing under potential pioneers’ feet. Potential economic, scientific and even security benefits underlie an emerging geopolitical competition to pursue space mining. The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. The United States has adopted the world’s first space resources law, recognizing the property rights of private companies and individuals to materials gathered in space. However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we’ll need new agreements to facilitate private investment and ensure international cooperation. What’s Out There Back up for a moment. For the record, space is already being heavily exploited, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter. In the past several decades, planetary science has confirmed what has long been suspected: celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuable. Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. So-called “rare earth” metals are also potential targets of asteroid miners intending to service Earth markets. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage. The Moon is a prime space mining target. Boosted by NASA’s mining solicitation, it is likely the first location for commercial mining. The Moon has several advantages. It is relatively close, requiring a journey of only several days by rocket and creating communication lags of only a couple seconds — a delay small enough to allow remote operation of robots from Earth. Its low gravity implies that relatively little energy expenditure will be needed to deliver mined resources to Earth orbit. The Moon may look parched — and by comparison to Earth, it is. But recent probes have confirmed substantial amounts of water ice lurking in permanently shadowed craters at the lunar poles. Further, it seems that solar winds have implanted significant deposits of helium-3 (a light stable isotope of helium) across the equatorial regions of the Moon. Helium-3 is a potential fuel source for secondand third-generation fusion reactors that one hopes will be in service later in the century. The isotope is packed with energy (admittedly hard to unleash in a controlled manner) that might augment sunlight as a source of clean, safe energy on Earth or to power fast spaceships in this century. Between its water and helium-3 deposits, the Moon could be the resource stepping-stone for further solar system exploration. Asteroids are another near-term mining target. There are all sorts of space rocks hurtling through the solar system, with varying amounts of water, rare earth metals and other materials on board. The asteroid belt between the orbits of Mars and Jupiter contains most of them, many of which are greater than a kilometer in diameter. Although the potential water and mineral wealth of the asteroid belt is vast, the long distance from Earth and requisite travel times and energy consumption rule them out as targets in the near term. Wannabe asteroid miners will thus be looking at smaller near-Earth asteroids. While they are much further away than the Moon, many of them could be reached using less energy — and some are even small enough to make it technically possible to tow them to Earth orbit for mining. Space mining may be essential to crewed exploration missions to Mars. Given the distance and relatively high gravity of Mars (twice that of the Moon), extraction and export of minerals to Earth seems highly unlikely. Rather, most resource extraction on Mars will focus on providing materials to supply exploration missions, refuel spacecraft and enable settlement. Technology Is the Difference The prospects for space mining are being driven by technological advances across the space industry. The rise of reusable rocket components and the now-widespread use of off-the-shelf parts are lowering both launch and operations costs. Once limited to government contract missions and the delivery of telecom satellites to orbit, private firms are now emerging as leaders in developing “NewSpace” activities — a catch-all term for endeavors including orbital tourism, orbital manufacturing and mini-satellites providing specialized services. The space sector, with a market capitalization of $400 billion, could grow to as much as $1 trillion by 2040 as private investment soars. But despite the high-profile commercial advances, governments still call the shots on the leading edge of space resource technologies. The United States extracted the first extraterrestrial materials in space from the Moon during the Apollo missions, followed by the Soviet Union’s recoveries from crewless Luna missions. President Biden recently borrowed one of the Apollo lunar rocks for display in the Oval Office, highlighting the awe that deep space can still summon. For the time being, scientific samples remain the goal of mining. Last October, NASA’s OSIRIS-REx mission — due to return to Earth in 2023 — collected a small amount of material from the asteroid Bennu. In December, Japan returned a sample of the asteroid Ryugu with the Hayabusa2 spacecraft. And several weeks later, China’s Chang’e 5 mission returned the first lunar samples since the 1970s. Sample collection is accelerating, with recent missions targeting Mars. Japan is planning to visit the two moons of Mars and extract a sample from one. NASA’s robotic Perseverance rover will collect and cache drilled samples on Mars that could later be returned to Earth. Perseverance also carries gear for the unique MOXIE experiment on Mars — an attempt to produce oxygen on the planet with technologies that could eventually extract oxygen for astronauts to breath and refuel spacecraft.

#### Scenario 1 is Climate Change

#### **Increasing the supply of rare earth metals is crucial to the transition to green tech which is key to resolve climate chnage**

Riley 21 (Charles Riley; 5/5/21; CNN; *“A shortage of these metals could make the climate crisis worse”*; accessed 12/15/21; <https://www.cnn.com/2021/05/05/business/climate-crisis-metals-shortage/index.html>; Charles Riley is Europe Editor at CNN Business. Before joining the London bureau, he worked as a reporter and editor in New Delhi, Hong Kong, New York and Washington D.C.) HB

The world won't be able to tackle the climate crisis unless there is a sharp increase in the supply of metals required to produce electric cars, solar panels, wind turbines and other clean energy technologies, according to the International Energy Agency. As countries switch to green energy, demand for copper, lithium, nickel, cobalt and rare earth elements is soaring. But they are all vulnerable to price volatility and shortages, the agency warned in a report published on Wednesday, because their supply chains are opaque, the quality of available deposits is declining and mining companies face stricter environmental and social standards. Limited access to known mineral deposits is another risk factor. Three countries together control more than 75% of the global output of lithium, cobalt and rare earth elements. The Democratic Republic of Congo was responsible for 70% of cobalt production in 2019, and China produced 60% of rare earth elements while refining 50% to 70% of lithium and cobalt, and nearly 90% of rare earth elements. Australia is the other power player. In the past, mining companies have responded to higher demand by increasing their investment in new projects. But it takes on average 16 years from the discovery of a deposit for a mine to start production, according to the IEA. Current supply and investment plans are geared to "gradual, insufficient action on climate change," it warned. "These risks to the reliability, affordability and sustainability of mineral supply are manageable, but they are real," the Paris-based agency said in the most comprehensive report on the issue to date. "How policy makers and companies respond will determine whether critical minerals are a vital enabler for clean energy transitions, or a bottleneck in the process." The minerals are essential to technologies that are expected to play a leading role in combating climate change. The average electric car requires six times more minerals than a conventional car, according to the IEA. Lithium, nickel, cobalt, manganese and graphite are crucial to batteries. Electricity networks need huge amounts of copper and aluminum, while rare earth elements are used in the magnets needed to make wind turbines work. Meeting the goals of the Paris climate agreement will require a "significant" increase in clean energy, according to the IEA, which estimates that the annual installation of wind turbines would need to grow threefold by 2040 and electric car sales would need to expand 25 times over the same period. Reaching net zero emissions by 2050 would require even more investment. "The data shows a looming mismatch between the world's strengthened climate ambitions and the availability of critical minerals that are essential to realizing those ambitions," Fatih Birol, executive director of the IEA, said in a statement. "The challenges are not insurmountable, but governments must give clear signals about how they plan to turn their climate pledges into action." The agency said that policymakers should provide more clarity on the energy transition, promote the development of new technology and recycling, enhance supply chain resilience and encourage higher environmental, social and governance (ESG) standards. The IEA, which advises the world's richest countries and was founded after the oil supply shocks in the 1970s, said that mineral supplies will be the energy security challenge of the 21st century. "Concerns about price volatility and security of supply do not disappear in an electrified, renewables-rich energy system," it said.

**Climate change causes extinction – ocean acidification, water and resource wars, econ collapse, and regional conflicts.**

Pachauri and Meyer 15 (Rajendra K. Pachauri Chairman of the IPCC, Leo Meyer Head, Technical Support Unit IPCC were the editors for this IPCC report, “Climate Change 2014 Synthesis Report” <http://epic.awi.de/37530/1/IPCC_AR5_SYR_Final.pdf> IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp)

SPM 2.3 Future risks and impacts caused by a changing climate Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development. {2.3} Risk of climate-related impacts results from the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability and exposure of human and natural systems, including their ability to adapt. Rising rates and magnitudes of warming and other changes in the climate system, accompanied by ocean acidification, increase the risk of severe, pervasive and in some cases irreversible detrimental impacts. Some risks are particularly relevant for individual regions (Figure SPM.8), while others are global. The overall risks of future climate change impacts can be reduced by limiting the rate and magnitude of climate change, including ocean acidification. The precise levels of climate change sufficient to trigger abrupt and irreversible change remain uncertain, but the risk associated with crossing such thresholds increases with rising temperature (medium confidence). For risk assessment, it is important to evaluate the widest possible range of impacts, including low-probability outcomes with large consequences. {1.5, 2.3, 2.4, 3.3, Box Introduction.1, Box 2.3, Box 2.4} A large fraction of species faces increased extinction risk due to climate change during and beyond the 21st century, especially as climate change interacts with other stressors (high confidence). Most plant species cannot naturally shift their geographical ranges sufficiently fast to keep up with current and high projected rates of climate change in most landscapes; most small mammals and freshwater molluscs will not be able to keep up at the rates projected under RCP4.5 and above in flat landscapes in this century (high confidence). Future risk is indicated to be high by the observation that natural global climate change at rates lower than current anthropogenic climate change caused significant ecosystem shifts and species extinctions during the past millions of years. Marine organisms will face progressively lower oxygen levels and high rates and magnitudes of ocean acidification (high confidence), with associated risks exacerbated by rising ocean temperature extremes (medium confidence). Coral reefs and polar ecosystems are highly vulnerable. Coastal systems and low-lying areas are at risk from sea level rise, which will continue for centuries even if the global mean temperature is stabilized (high confidence). {2.3, 2.4, Figure 2.5} Climate change is projected to undermine food security (Figure SPM.9). Due to projected climate change by the mid-21st century and beyond, global marine species redistribution and marine biodiversity reduction in sensitive regions will challenge the sustained provision of fisheries productivity and other ecosystem services (high confidence). For wheat, rice and maize in tropical and temperate regions, climate change without adaptation is projected to negatively impact production for local temperature increases of 2°C or more above late 20th century levels, although individual locations may benefit (medium confidence). Global temperature increases of ~4°C or more 13 above late 20th century levels, combined with increasing food demand, would pose large risks to food security globally(high confidence). Climate change is projected to reduce renewable surface water and groundwater resources in most dry subtropical regions (robust evidence, high agreement), intensifying competition for water among sectors (limited evidence, medium agreement). {2.3.1, 2.3.2} Until mid-century, projected climate change will impact human health mainly by exacerbating health problems that already exist (very high confidence). Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change (high confidence). By 2100 for RCP8.5, the combination of high temperature and humidity in some areas for parts of the year is expected to compromise common human activities, including growing food and working outdoors (high confidence). {2.3.2} In urban areas climate change is projected to increase risks for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise and storm surges (very high confidence). These risks are amplified for those lacking essential infrastructure and services or living in exposed areas. {2.3.2} Rural areas are expected to experience major impacts on water availability and supply, food security, infrastructure and agricultural incomes, including shifts in the production areas of food and non-food crops around the world (high confidence). {2.3.2} Aggregate economic losses accelerate with increasing temperature (limited evidence, high agreement), but global economic impacts from climate change are currently difficult to estimate. From a poverty perspective, climate change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger (medium confidence). International dimensions such as trade and relations among states are also important for understanding the risks of climate change at regional scales. {2.3.2} Climate change is projected to increase displacement of people (medium evidence, high agreement). Populations that lack the resources for planned migration experience higher exposure to extreme weather events, particularly in developing countries with low income. Climate change can indirectlyincrease risks of violent conflicts by amplifying well-documented drivers of these conflicts such as poverty and economic shocks (medium confidence). {2.3.2} 2010 )

#### Scenario 2 is Water shortages

#### **Water shortages are an impact-multiplier – it causes food shortages, disease and the scale of conflicts**

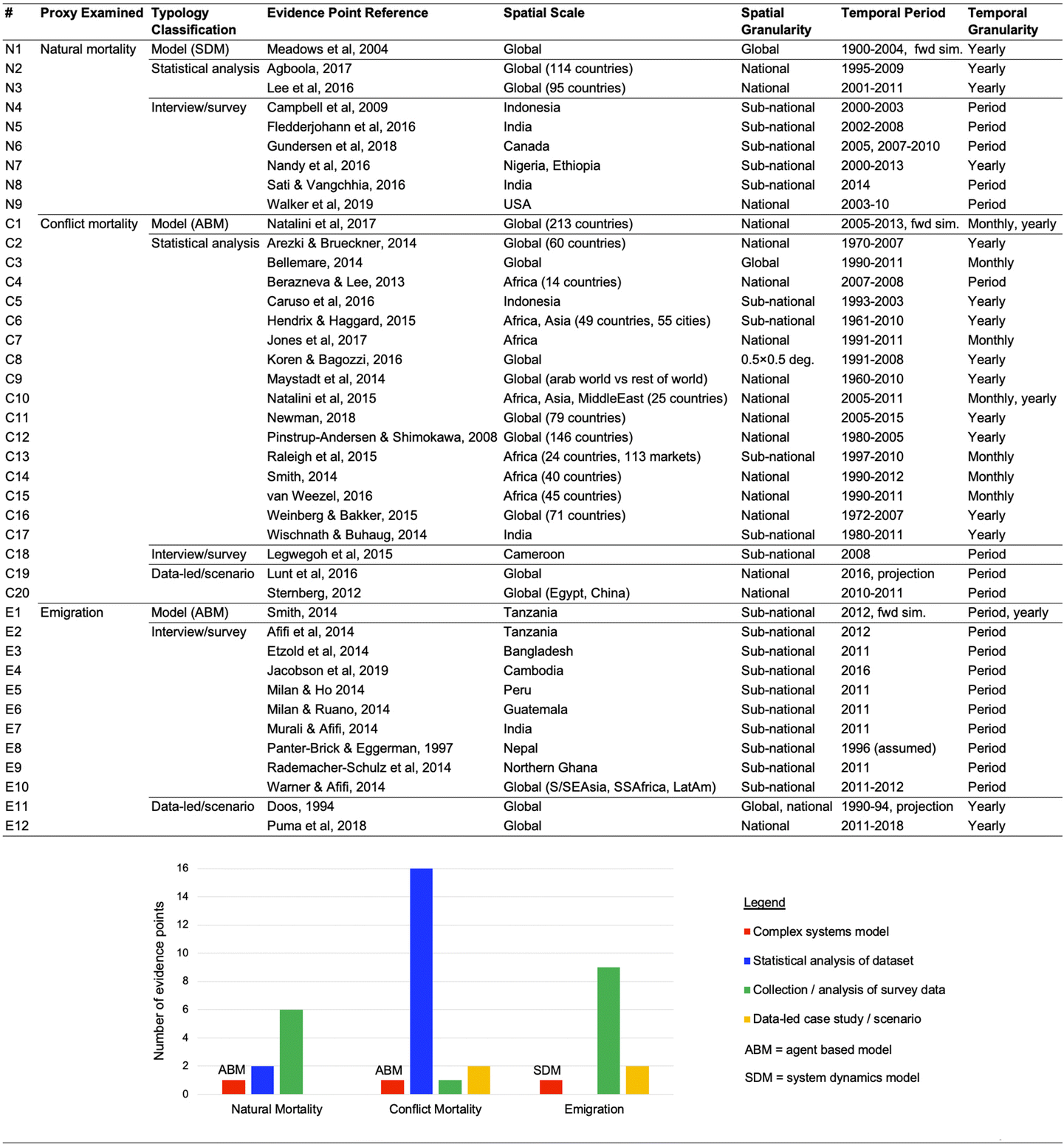
Milne 21 (Sandy Milne; 8/16/21; BBC Future; *“How water shortages are brewing wars”*; accessed 12/15/21; <https://www.bbc.com/future/article/20210816-how-water-shortages-are-brewing-wars>; Sandy Milne is a journalist based in Perth, Australia. He has reported and written features for BBC Global, the SBS, Wired, Nikkei Asia, and Crikey) HB

Around the world, stories like al Sadr's are becoming far too common. As much as a quarter of the world's population now faces severe water scarcity at least one month out of the year and – as in al-Sadr's case – it is leading many to seek a more secure life in other countries. "If there is no water, people will start to move," says Kitty van der Heijden, chief of international cooperation at the Netherlands' foreign ministry and an expert in hydropolitics. Water scarcity affects roughly 40% of the world's population and, according to predictions by the United Nations and the World Bank, drought could put up to 700 million people at risk of displacement by 2030. People like van der Heijden are concerned about what that could lead to. "If there is no water, politicians are going to try and get their hands on it and they might start to fight over it," she says. Over the course of the 20th Century, global water use grew at more than twice the rate of population increase. Today, this dissonance is leading many cities – from Rome to Cape Town, Chennai to Lima – to ration water. Water crises have been ranked in the top five of the World Economic Forum's Global Risks by Impact list nearly every year since 2012. In 2017, severe droughts contributed to the worst humanitarian crisis since World War Two, when 20 million people across Africa and the Middle East were forced to leave their homes due to the accompanying food shortages and conflicts that erupted. Peter Gleick, head of the Oakland-based Pacific Institute, has spent the last three decades studying the link between water scarcity, conflict and migration and believes that water conflict is on the rise. "With very rare exceptions, no one dies of literal thirst," he says. "But more and more people are dying from contaminated water or conflicts over access to water." Gleick and his team are behind the Water Conflict Chronology: a log of 925 water conflicts, large and small, stretching back to the days of the Babylonian king Hammurabi. It is not, by any means, exhaustive and the conflicts listed vary from full blown wars to disputes between neighbours. But what they reveal is that the relationship between water and conflict is a complex one. "We categorised water conflicts in three groups," says Gleick. "As a 'trigger' of conflict, where violence is associated with disputes over access and control of water; as a 'weapon' of conflict, where water or water systems are used as weapons in conflicts, including for the use of dams to withhold water or flood downstream communities; and as 'casualties' or 'targets' of conflicts, where water resources or treatment plants or pipelines are targeted during conflicts." Leaf through the records he and his colleagues have compiled, however, and it becomes clear that the bulk of the conflicts are agriculture-related. It's perhaps not surprising as agriculture accounts for 70% of freshwater use. In the semi-arid Sahel region of Africa, for example, there are regular reports of herdsmen and crop farmers clashing violently over scarce supplies of water needed for their animals and crops. But as demand for water grows, so too does the scale of the potential conflicts. "The latest research on the subject does indeed show water-related violence increasing over time," says Charles Iceland, global director for water at the World Resources Institute. "Population growth and economic development are driving increasing water demand worldwide. Meanwhile, climate change is decreasing water supply and/or making rainfall increasingly erratic in many places." Nowhere is the dual effect of water stress and climate change more evident than the wider Tigris-Euphrates Basin – comprising Turkey, Syria, Iraq and western Iran. According to satellite imagery, the region is losing groundwater faster than almost anywhere else in the world. And as some countries make desperate attempts to secure their water supplies, their actions are affecting their neighbours. During June 2019, as Iraqi cities sweltered through a 50C (122F) heatwave, Turkey said it would begin filling its Ilisu dam at the origins of the Tigris. It is the latest in a long-running project by Turkey to build 22 dams and power plants along the Tigris and the Euphrates that, according to a report by the French International Office for Water, is significantly affecting the flow of water into Syria, Iraq and Iran. It claims that when complete Turkey's Guneydogu Anadolu Projesi (GAP) could include as many as 90 dams and 60 power plants. As water levels behind the mile-wide Ilisu dam rose, the flow from the river into Iraq halved. Thousands of kilometres away in Basra, al-Sadr and his neighbours saw the quality of their water deteriorate. In August, hundreds of people began pouring into Basra's hospitals suffering from rashes, abdominal pain, vomiting, diarrhoea, and even cholera, according to Human Rights Watch. "There's actually two parts to the story in Basra," Iceland says. "Firstly, you have the obvious discharge of wastewater into local waterways without any treatment. But you've also got to consider the damming at the Turkish border – with less freshwater flowing down the Tigris and Euphrates, saltwater is intruding further up the river (from the Persian Gulf). Over time, it's ruining crops and it's making people sick." It's a complicated picture, but this ability to see links between the seemingly disparate has informed Iceland's work with the Dutch government-funded Water, Peace and Security (WPS) partnership, a group of six American and European NGOs (including the Pacific Institute and the World Resources Institute). They've developed a Global Early Warning Tool, which uses machine learning to predict conflicts before they happen. It combines data about rainfall, crop failures, population density, wealth, agricultural production, levels of corruption, droughts, and flooding, among many other sources of data to produce conflict warnings. They are displayed on a red-and-orange Mercator projection down to the level of administrative districts. Currently it is warning of around 2,000 potential conflict hotspots, with an accuracy rate of 86%. But while the WPS Tool can be used to identify locations where conflicts over water are at risk of breaking out, it can also help to inform those hoping to understand what is happening in areas that are already experiencing strife due to water scarcity. India's Northern Plains, for example, are one of the most fertile farming areas in the world, yet today, villagers regularly clash over water scarcity. The underlying data reveals that population growth and high levels of irrigation have outstripped available groundwater supplies. Despite the area's lush-looking cropland, the WPS map ranks nearly every district in Northern India as "extremely high" in terms of baseline water stress. Several key rivers which feed the area – the Indus, Ganges and Sutlej – all originate on the Tibetan side of the border yet are vital for water supplies in both India and Pakistan. compounds the problem. Several border skirmishes have broken out recently between India and China, which lays claim to upstream areas. A violent clash in May last year in the Galwan Valley, through which a tributary to the Indus flows, left 20 Indian soldiers dead. Less than a month later there were reports that China was building "structures" that might dam the river and so restrict its flow into India.

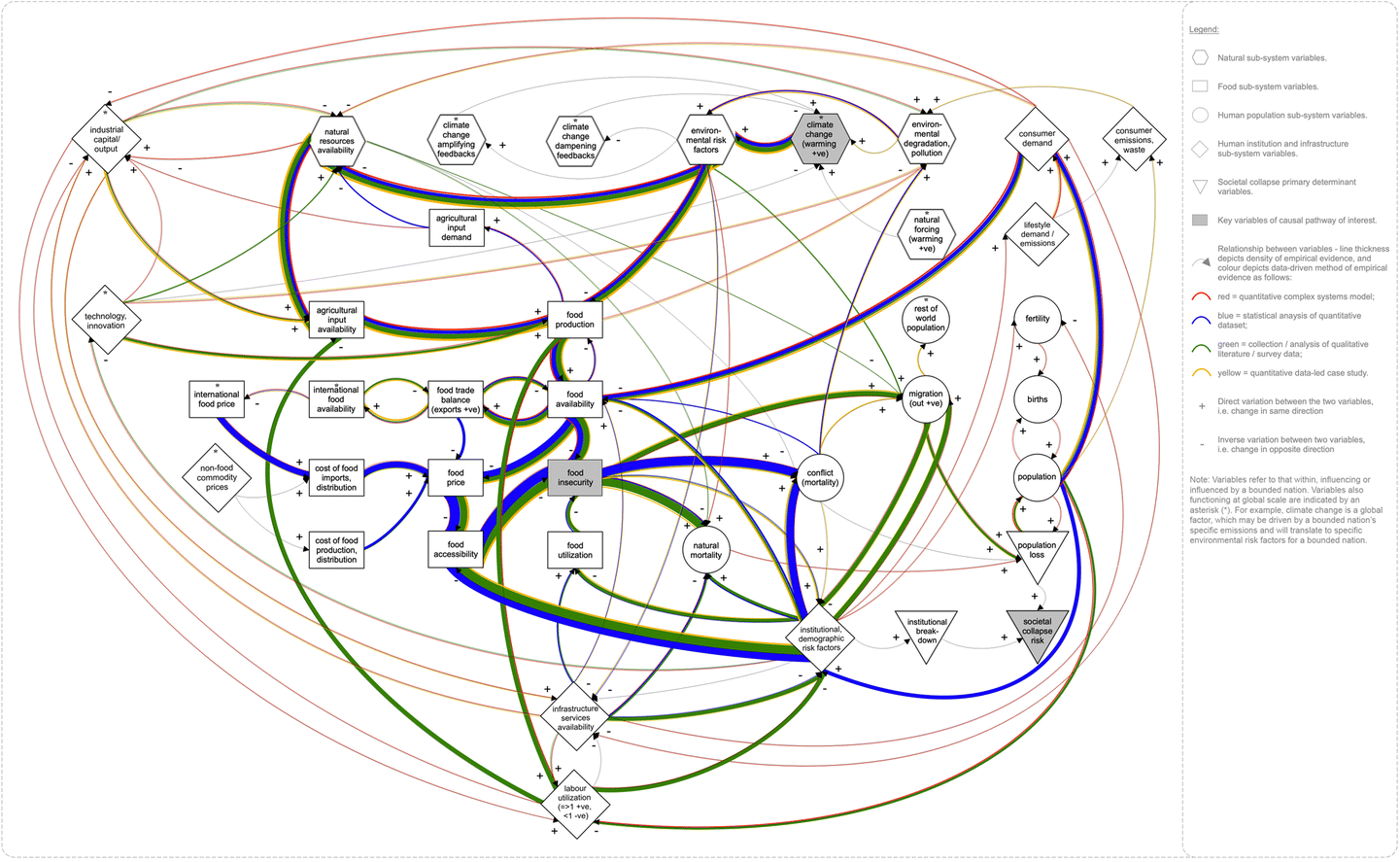
#### Independently, resilient food supply is vital to prevent widespread famine---extinction – we’ve got charts!

Richards et al. 21, C.E. Richards is with the Department of Engineering, University of Cambridge; R.C. Lupton is with the Department of Engineering, University of Cambridge, and the Department of Mechanical Engineering, University of Bath; J.M. Allwood is with the Department of Engineering, University of Cambridge, “Re-Framing the Threat of Global Warming: An Empirical Causal Loop Diagram of Climate Change, Food Insecurity and Societal Collapse,” Climatic Change, vol. 164, no. 3, 02/19/2021, p. 49

The new empirical evidence base (Section 3, Step I), along with its colour-coded typology (Section 3, Step II), is presented in Fig. 4. It consists of 41 evidence points, of which 9 examine the natural mortality (i.e. starvation, with respect to food insecurity), 20 the conflict mortality and 12 the emigration societal collapse proxy, alongside other human and natural world system factors. We discuss three key aspects of the evidence base, namely temporal and spatial distribution, data-driven method distribution and advantages of each data-driven methods, below.



Summary and custom colour-coded typology of the new empirical evidence base of climate change, food insecurity and societal collapse in contemporary society. A full reference list is contained in Supplementary Information (E) The temporal scale and granularity of study varies across the evidence base; however, our methodology limited the possible scale of study to the period from 1990 to present, representative of contemporary society. Within this period, approximately half of the evidence points cover a scale of less than one decade and the other half a scale of greater than one decade. Approximately half of the evidence points conduct analyses at yearly granularity and the other half conduct analyses at granularity greater than one year, with only a few studies conducting analyses at monthly granularity. The spatial scale and granularity of study varies across the evidence base. Approximately one third of the evidence points investigate the system at a global scale, with the remaining two thirds focusing on regional or national scales, primarily in Africa as well as the Middle East and Asia. Approximately half of the evidence points analyse the causal pathway at sub-national granularity, with the other half primarily focusing on national-level granularity. This variation provided different coverage of the complex relationships within the system, which was informative for constructing our CLD. The distribution of data-driven methods used across the evidence base is notably different for each societal collapse proxy. Evidence points for natural mortality mostly use collection/analysis of interview/survey data. This is likely because the minimum daily food intake for human survival is well established (FAO 2004); as such, statistical analysis of food and mortality data sets would not yield significantly new insights into thresholds whereas interviews/surveys can provide insight into an individual’s circumstances influencing this relationship. Evidence points for conflict mortality mostly use statistical analysis of existing datasets. This likely reflects the interest in rigorously curated conflict datasets, such as UCDP/PRIO (2019), across the conflict and peace fields. Evidence points for emigration mostly use collection/analysis of interview/survey data, likely because this provides nuanced insight into an individual’s decision to migrate. It may also be due to data availability and quality challenges that limit quantitative statistical analyses, which are being addressed by groups such as IOM GMDAC (2019). Amongst these data challenges, it is important to recognise the issue of reconciling different types of voluntary and forced migration with causal drivers, given the complex social, economic and political factors at play; this challenge similarly applies to the other societal collapse proxies but is particularly noted in the migration studies. We observe from these studies that a food insecurity threshold for natural mortality is well established but thresholds for conflict mortality and emigration are not. Indeed, distinguishing causal drivers within datasets and defining quantitative thresholds for these determinants remains a ‘grand challenge’ (Kintigh et al. 2014). Each data-driven method offers different advantages. The complex systems models each describe ‘chunks’ of the system at different scale and granularity. The models provide mathematical definition, are calibrated to real-world data and enable quantitative simulation of key relationships in the system. The statistical analyses quantitatively examine relationships between a dependent variable and one or more independent variables within the system, which can be used as a mathematical basis for extending modelling capabilities. The collection/analysis of interview/survey data provides insight into qualitative aspects of human perspective and decision-making that quantitative data sets cannot provide directly. The data-led case study/scenarios combine quantitative data with qualitative expert interpretation to better understand global trends and forecasts. These latter two methods can also be used to inform the development of modelling capabilities, the scenarios analysed by such models and their application in decision-making processes. Collectively, these different data-driven methods can yield useful insights into the nuances of relationships in the system of interest. Causal loop diagram of the climate change, food insecurity and societal collapse in contemporary society at global scale and national granularity The main result of this paper is the CLD (the f-CLD from Section 3, Step V), presented in Fig. 5. It structures the relationships between climate change, food insecurity and societal collapse as described in our new empirical evidence base (presented in Fig. 4 and discussed in Section 4.1.). We discuss three key aspects of the CLD, namely insights related to the spread of empirical evidence, the qualitative complex system depicted, and quantitative complex system modelling, below, alongside consideration of well-established benefits and limitations of CLDs.



Causal loop diagram of climate change, food insecurity and societal collapse in contemporary society at global scale and national granularity. Variables are depicted as nodes in five different shapes, indicating different sub-systems. Links between variables are depicted as arrowed lines, indicating the direction of the relationship. Each link has a positive (+) or negative (−) notation, indicating that the two variables change in the same direction or opposite direction, respectively. The density and type of data-driven method of the empirical evidence base, from which the causal loop diagram was constructed, are depicted by line thickness and colour, respectively Our CLD is presented in a novel format that documents the spread of our empirical evidence base. We use line thickness and colour, respectively, to depict the density and type of the data-driven methods used by the empirical evidence points to analyse a given link between two variables. Doing this aids comprehension of where existing work has been focused with respect to the climate change, food insecurity and societal collapse causal pathway. It may also help with the identification of gaps in existing analyses. For example, we can see that the link between food insecurity and conflict has been investigated mostly by evidence points using statistical analyses (blue), whereas the links between food insecurity and migration, and food insecurity and natural mortality, have been investigated mostly by evidence points using interviews/surveys (green). This hints that it may be useful to investigate the former using quantitative statistics, and the latter using qualitative interviews/surveys, to gain further insights offered by the different data-driven methods as described in Section 4.1. It is important to recognise that our CLD may show negligible density for important links or even be missing important variables and/or links, either because they have not yet been studied or because our key word search failed to identify evidence points that have studied them. For example, our study focused on the climate change, food insecurity and societal collapse causal pathway, so the density of our empirical evidence is concentrated along links central to this pathway; whereas, the links between peripheral variables in the system, such as between fertility and births, show a lower density of empirical evidence. Similarly, our use of the population loss set of societal collapse proxies means that the evidence base details natural mortality, conflict mortality and emigration; whereas, the institutional breakdown set are not detailed. In considering this issue, our methodology attempted to maximise the rigour and transparency of our study by documenting the spread of our empirical evidence base to help make the reader aware of exactly how much and what type of evidence was supporting the CLD presented here. Further, we can see that while empirical studies have linked climate change via food insecurity to our societal collapse proxies of natural mortality, conflict mortality and emigration, we found no empirical studies linking these proxies to the explicit term of societal collapse. This was expected given the motivation of this study (Section 1) and is due to the fact that there are no contemporary events of societal collapse, under the same definition as those in the historical studies pre-dating contemporary society, that enable these links to be empirically studied (Beard et al. 2020). Having considered the spread of empirical evidence, we now consider the complex system documented. A key benefit of CLDs is that they simply present a myriad of information in a single diagram; in doing so, CLDs enable comprehension of the structure and behaviour of complex systems, including feedbacks, intervention points and far-reaching interdependencies (Sterman 2011). Our CLD visually depicts a system of 39 variables, 105 links and 32,000 feedback loops,Footnote1 integrating information from different fields including climate science, food security, conflict, migration and health research. Walking through the CLD at a high-level, we can see how population growth and lifestyle emissions, influenced by institutional/demographic factors (e.g. emission reduction incentives), combine to directly drive climate change. Similarly, they indirectly drive climate change via consumer demand on food production, which produces emissions directly (e.g. ruminant livestock) and indirectly via industrial capital/output (e.g. processing factories). The environmental risk factors (e.g. extreme weather events) of climate change may cause losses of food production either directly (e.g. plant disease) or indirectly via agricultural input availability (e.g. loss of water source for irrigation). A country’s food availability is influenced by domestic food production and international food trade. Food accessibility is influenced by its food price, which responds to domestic (e.g. cost of food production and distribution) and international (e.g. international food price) markets, and institutional/demographic factors (e.g. food subsidies). Food utilization is influenced by infrastructure/services (e.g. education) and institutional/demographic factors (e.g. cultural traditions). Food insecurity is underpinned by these three pillars of food availability, food accessibility and food utilization. For a given country, food insecurity can drive natural mortality (i.e. starvation), conflict and migration, contributing to population loss, as well as economic shocks and socio-political instability, contributing to institutional breakdown, which exacerbates the risk of societal collapse. Beyond a given country suffering increased natural mortality, famines (i.e. food insecurity) can place pressure on international humanitarian efforts (i.e. institutional risk factors). Conflict may occur domestically or internationally and can feedback to exacerbate food insecurity and institutional fragility (i.e. institutional risk factors). Potential mass emigration can increase pressure on food availability, natural resources and infrastructure/services in the destination nation, which can lead to socio-cultural tensions (i.e. institutional risk factors) that fuel conflict. Food insecurity can also directly contribute to institutional risk factors such as social unrest, political instability and economic inequality, which increase the risk of societal collapse due to institutional breakdown, that may also cascade internationally. While already fragile states are expected to be hit the worst directly, these insights reveal the indirect ramifications of climate change on our globalised society (Kemp 2020), with serious consequences for humanity’s ‘existential security’ (Sears 2020). While some of these relationships may appear obvious, it is the act of bringing this information, which may otherwise be siloed and thus preventing consideration of the full story, together in one place that is of value (Sterman 2011). In doing so, our CLD attempts to provide readers with the opportunity to explore the climate change, food insecurity and societal collapse causal pathway, consider worst-case scenarios that we want to avoid, develop transformative narratives of “where we want to go” and think about interventions that may help us attain this desired future (Hinkel et al. 2020).

### 2

#### Space is an intrinsic part of India’s soft power expansion and they’re set to rapidly scale now

Kathayat ‘20

Sarthak Kathayat, Sarthak Kathayat is a student at Jamia Millia Islamia, India., NIICE NEPAL, 11-1-2020, "Soft Power and India’s Space Diplomacy," https://niice.org.np/archives/6420 TDI

In international relations, soft power is the ability of any country to persuade other countries to do what it wants without the use of force. According to Joseph Nye Jr., soft power is – getting others to want the outcomes that you want – co-opts people rather than coerces them. As compared to hard power, soft power takes relatively longer to built as its intangible resources develop over a long time. Soft power tends to change other party’s attitude to the end where she acts voluntarily in a way which is different to her usual behaviour. Several characteristics of the current world order like globalisation driven economic interdependence, rise of transnational actors, resurgence of nationalism in weak states, the spread of military technology and the changed nature of international political problems have significantly reduced the effectiveness of hard power strategies. The most noteworthy example of a foreign policy misadventure based solely on hard power strategies is the 2003 US invasion of Iraq. Soft power also has its own weakness. However, the ineffectiveness of soft power strategies is an exception. In longer-term, soft power strategies appear to be more effective in the contemporary world order than the hard power. One such tool of soft power is the space technology and space diplomacy. Space technology are increasingly viewed as a crucial instrument of soft power as states have now understood the direct relation between the technological feats and global prestige that follows. Expertise in rocket science puts a state on a higher pedestal than the countries who are still struggling in the domain. Moreover, expertise in rocket science ensues significant strategic implications. The output delivered has noteworthy social and economic relevance with a massive growth potential. In a broadening concept of security that encompasses other dimensions such as economic, environmental and political, Indian space programme has been distinctive and lucid in the way it simultaneously addresses the requirements of the Indian citizenry and the state collectively in all the dimensions. Despite being challenged by numerous embargoes and technology denial regimes during Cold War, Indian space programme has emerged as the most cost-effective and successful space programme in the world. India’s space programme has been a tremendous achievement for a developing country which despite being faced with many challenges used space as a crucial mechanism to lift its people out of poverty through education, social and economic programmes. With the course of time, India’s space policy has become an intrinsic part of India’s foreign policy to strengthen India’s position as a dominant power in South Asia. Indian Space Programme India’s space programme has been seen making efforts in projecting soft power which is especially evident through its new commitment to planetary exploration and human spaceflight. The Chandrayaan-1 and Mangalyaan-1 mission cleared the fact that India now looks at space as a standard of global standing. India’s soft power has witnessed a progression with an increasingly successful participation in global space economy through ISRO’s commercial arm, Antrix Corporation. India’s growing influence on the global space economy has been an indication of its changing stature in international arena. India has also been involved in capacity building initiatives. It has successfully established itself as a leader in terms of healthcare provisions through satellite-based telemedicine. India hosts the largest telemedicine network in South Asia which has also expanded to the African continent. A non-profit Indian organisation named Apollo Telemedicine Networking Foundation has been involved in telemedicine services with dedicated centres in Iraq, Yemen, Kazakhstan and Myanmar. India’s Space Diplomacy Further using space for diplomacy in order to project its soft power across the globe, India has assisted countries like Colombia in launching its satellite which boosted India-Colombia relations. Many Latin American countries are often dependent on the US for space and military matters. However, after the launch, many countries like Argentina, Bolivia, Brazil, Chile, Ecuador, Mexico, Nicaragua and Venezuela have reached out to ISRO for launching or developing satellites. Similarly, India’s PSLV also launched Israel’s TecSar satellite in 2008 for remote sensing purposes. The launch boosted the political and strategic relations with Israel. Once a recipient of space technology from developed countries, India has demonstrated the robustness of its own space programmes by setting up joint projects and even providing assistance at the time of disaster to a number of countries. ISRO’s Oceansat-2 satellite played a pertinent role in monitoring Hurricane Sandy and helping the authorities to implement timely disaster mitigation and rescue strategies. Adding more feathers to its hat, ISRO has also launched dozens of satellites for US, Europe and Britain based companies. The recent launches of British reconnaissance satellites, NovaSAR and S1-4 are a sign of what could come next. Britain is one of the EU’s biggest spender in space sector. After Brexit, the dispute over Britain’s continued access to the European Union’s Galileo satellite navigation project will inevitably lead Britain look for alternatives and India’s space ambitions could offer a tempting proposition within the ambit of wider bilateral cooperation. As a part of India’s efforts in space diplomacy, ISRO undertook another capacity building initiative ‘Unispace Nanosatellite Assembly and Training (UNNATI)’. Under UNNATI, ISRO planned to train 45 countries in making Nano-satellites. Closer to home, India proposed a SAARC satellite in 2014 for the overall development of the region. The proposal was welcomed by SAARC nations but unfortunately the proposal couldn’t materialise as envisioned initially due to Pakistan’s backing out from the project. However, three years later, in 2017, ISRO launched the South Asia satellite or GSAT-9 to help India’s neighbouring countries in space communication. The idea of South Asia satellite ensured no political impediment as with the case of SAARC satellite. The positive spill over effect of the satellite’s launch on India’s “neighbourhood first” diplomacy was well demonstrated by the warm responses given by the leaders of South Asian countries. India’s space diplomacy with neighbours also extends on a bilateral basis. For instance, in Afghanistan, India included remote sensing satellite transmitters for acquiring space-based data in a USD 1.2 billion aid package. It is evident that soft power strategies are more relevant than the hard power strategies, especially in the contemporary world order. The rise of China as an emerging superpower is backed with its economic and military might leave less avenues for other developing nations such as India to contest China. However, soft power strategies open up another dimension for the interaction of the nations. India has utilised space as a tool of its soft power effectively in order to expand its clout. That space being an intrinsic part of India’s foreign policy has brought numerous achievements to the country, and is expected to remain an essential element for future course of India’s foreign policy.

#### Private sector key to Indian space efforts

Krishnan ‘20

Raghu Krishnan, Raghu Krishnan is the technology editor for the Economic Times. In the over two decades of reporting and managing teams, he has seen the Indian IT industry grow from $ 1 billion to nearly $ 191 billion. He has a deep understanding of the shifts the Indian IT industry has undergone over the years. He has also covered science and India's aerospace R&D industry., 12-7-2020, "New space policy may take local companies global: Sivan," Economic Times, https://economictimes.indiatimes.com/news/science/new-space-policy-may-take-local-companies-global-sivan/articleshow/79599874.cms?from=mdr TDI

Bengaluru: India will draft a new space policy aimed at increasing private investments in the country’s space sector to build companies that are global in scale, Indian Space Research Organisation (Isro) chairman K Sivan told ET. The proposed regulations will be in addition to specific policies planned for launch vehicles, satellite navigation, human space mission and deep space exploration. “We want to create competition and get multiple companies in the space sector that can grow as global leaders,” Sivan said. Over 23 Indian and overseas companies have approached Isro since August seeking to harness assets built over six decades including rockets, satellites, ground stations and satellite imagery. The nodal agency is looking to transfer critical technologies through its commercial arm — New Space India Ltd (NSIL NSE -0.45 %) — to these companies at lower costs. “Space technology is costly. We want to make it viable for Indian industries and help them commercialise these technologies,” said Sivan. “We want to make the technology transfer a very simple and low-cost affair.” Last week, NSIL signed a pact to share technology as well as to allow testing facilities with Chennai-based startup Agnikul Cosmos to build a small rocket that can hurl 100 kg satellites to low-earth orbit. Bengaluru-based Pixxel, which is building India’s first private fleet of earth observation satellites, will launch its first satellite atop the homegrown polar satellite launch vehicle (PSLV) in 2021. So far, the department of space has released drafts of technology transfer policy, remote sensing and satellite communication policy for public comments. These draft policies state that Indian companies can now own and operate satellites, build rockets and launch them from Indian soil and offer satellite-based applications to consumers. The policies also define how sensitive dual-use technologies are to be utilised and stresses on the need for adherence to national and international laws. “The industry players are able to see the sea change (in our policies). They are asking for clarifications on some of them,” said Sivan. He added the policies will be notified after consultations. India is adopting the model of the US space agency National Aeronautics and Space Administration (NASA), which allowed private firms such as SpaceX to get access to its technology and facilities to build reusable rockets that have carried humans to space this year. NASA also allows startups to compete and build vehicles and solutions for its programmes, including deep space missions. The policies are also designed to make India a global hub for satellite manufacturing and launches and providing satellite-based services for global customers. Hyderabad-based Aerospace firm Ananth Technologies is setting up a joint venture with US satellite operator Saturn Satellites, through which it will first build two communication satellites and launch them locally on an Indian rocket. Ananth is the first Indian private company to tap the global market after India opened up its space sector, which allows private firms to build satellites and rockets and offer space services from the country. “Earlier, when IITs produced aero-space engineers, there was not a strong domestic industrial ecosystem to employ them. Today, with our historic reforms in the space sector, the last frontier before humanity has opened up to Indian talent,” Prime Minister Narendra Modi told a Pan IIT conference on Friday. India has nearly 50 space startups in the sector and over 1,000 companies — both small and medium enterprises (SMEs) and large enterprises such as Larsen & Toubro, Godrej Aerospace, Tata Advanced Systems and Hindustan Aeronautics, which have been vendors to Isro, building systems and subsystems for the space programme. After opening the space sector to private firms in August, the department of space formed Indian National Space Promotion and Authorisation Centre (IN-SPACe), a new body that will act as a regulator whose rulings would apply to the space agency as well as private firms in the country. Sivan said an independent board is being set up and an approval is expected from the government by the end of December.

#### Indian soft power is key to rebuilding international negotiations to combat climate change – international cooperation is razor thin with every choice being make or break – private tech investment in India is key.

Roy and Das ‘21

Joyashree Roy and Nandini Das and Shreya Some. “India Must Use SDG Framework to Strengthen Developmental Diplomacy.” ORF, 28 May 2021, https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/. // Phoenix

The twenty-first century economic growth agenda needs to be reframed to ensure that cleaner production and consumption processes — goal 12 of the United Nations’ Sustainable Development Goals (SDGs) — go hand in hand with pursuing dignified sustainable living for all[[1]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn1). The impacts of COVID-19 have made the basic needs for human wellbeing even more clear. Energy and water have emerged as the top needs, and are connected to several SDGs, including human health. Approximately 50 percent of the global population does not have access to the basics needed for dignified living, with most of the deprived living in South Asia, East Asia and Africa.

The 2021-2030 decade will be a landmark one for multiple reasons. During this period, an otherwise politically-fragmented global order has to deliver the 17 interconnected SDGs, without any region or people being excluded — a collective political promise made by all world leaders in 2015. Two more monumental agreements for global cooperation in developmental action were reached in 2015, to be accomplished during this decade — the Paris climate agreement to keep global warming well below the 2°C above pre-industrial levels[[2]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn2), and the Sendai Framework for Disaster Risk Reduction[[3]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn3). These international frameworks aim at shifting collective global policy priorities for developmental action to the sustainable development path by 2030[[4]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn4). Although 2020 will be remembered as the year of the COVID-19 pandemic, it also marked the 75th anniversary of the UN’s inception and the 30th anniversary of the launch of international climate negotiations, and was also set as the year from which carbon dioxide emissions’ growth should start reducing through global climate action (SDG 13)[[5]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn5).

The pandemic is expected to directly adversely impact the fulfilment of SDG 1 (no poverty), SDG 2 (zero hunger), SDG 3 (good health and wellbeing), SDG 4 (quality education), SDG 8 (decent work and economic growth) and SDG 11 (sustainable cities and communities)[[6]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn6). The global economic lockdown necessitated by the pandemic led to an increase in poverty and hunger, job losses, loss of human life, reduced access to educational services due to the digital divide, and the loss of income[[7]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn7). If indirect impacts are considered, COVID-19 will likely cause a setback to all the other SDGs as well, since it has, for instance, led to increased domestic violence[[8]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn8) and greater difficulty in accessing clean water[[9]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn9). There is growing literature on how to recover better from COVID-19 so that the developmental promises of 2015 can still be kept[[10]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn10). The global stimulus of US$ 12 trillion[[11]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn11)) following the pandemic is providing some hope for building back better, but doubts have been expressed about how much of this will be spent on priority sectors such as the key SDGs, including climate action[[12]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn12).

What economic recovery growth path each country adopts through the rest of this decade will be extremely important. Every choice made to meet developmental aspirations will matter, impacting the climate system and human wellbeing. Identifying synergies and mutually reinforcing developmental and climate actions will help countries set the best path to sustainability. Emission reduction by shutting down all economic activities should not be an option, nor is it desirable. The COVID-19-induced global shutdown of economic activity has already shown that any such disruption will mean a huge trade-off between SDG 13 (climate action) and all the other SDGs. The SDG framework provides for recovery through mutual cooperation across nations and the sharing of good practices[[13]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn13).

International diplomacy has also shifted from using hard power to soft power[[14]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn14), applied along multiple dimensions such as trade relations, economic cooperation or sanctions, and developmental cooperation. The SDGs provide a broader scope for developmental diplomacy. They allow for actions that are not limited to governmental initiatives, but can also be taken by educational and cultural institutions, and individuals. Cultural diplomacy can help to strengthen and achieve multiple SDGs through the exchange of ideas and information, capacity building, scientific and business cooperation, and private and multinational investment. Art, literature, music, sports and the promotion of tourism can enhance global solidarity, partnership and cooperation during the recovery period. Soft power can play a big role in the post-pandemic recovery process, helping to avoid conflicts and stem the rise of militancy, which typically thrive amid crises.

Whether the SDGs will be achieved by 2030 will depend on what happens in developing countries like India and those in South and East Asia and Africa. To implement equity and justice, approximately 50 percent of the global population deprived of the basics must be given access to decent living standards[[15]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn15). For India, which still has around 84 million people living below the poverty line, this is a key challenge[[16]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn16). There has been much debate on what population growth in the developing countries will mean for global consumption and carbon emissions in the decades ahead[[17]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn17), with some even suggesting that the developed world must manage its consumption responsibly to counter this[[18]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn18). But this issue will need deeper analysis and further conversations[[19]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn19).

Indian soft power diplomacy and the SDG framework

Adroit diplomacy, conducted through dialogue, negotiation and other non-violent means, including the use of soft power, can influence international decisions peacefully through cooperation. Climate diplomacy and sustainable development diplomacy are emerging as major instruments in the multilevel governance architecture. International cooperation can be seen as a vertical integration in a multilevel governance framework[[20]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn20), which leads to the building of trust. At international climate discussions — from the Stockholm Conference in 1972 (the first global meet to build environmental diplomacy) to the annual Conference of Parties — India has aligned with global aspirations for multilateral actions and pushed cooperation, thus building trust with the rest of the world [[21]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/#_edn21). India’s consistent position has been that developmental deficits have to be reduced through global cooperation in technology, innovation sharing, capacity building, and the sharing of best practices (economic, environmental or social). In the past decade, India has streamlined its development partnership administration under the Ministry of External Affairs’ economic relations division[[22]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn22), with neighbouring states and African countries within its ambit.

A key line of thinking in the post-pandemic world has been that development processes need to be more inward looking, with each country prioritising its own interests[[23]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn23). But there is an equally strong argument for global solidarity in this crisis, from vaccine sharing to providing equitable access to new knowledge, and including soft power diplomacy. Efforts are being made to identify and strengthen joint actions for economic growth and social justice without environmental damage[[24]](https://www.orfonline.org/expert-speak/india-must-use-sdg-framework-strengthen-developmental-diplomacy/" \l "_edn24), in keeping with the SDG framework. India’s investment in infrastructure developing in Nepal, Bangladesh and several African countries in the pre-COVID-19 period, and its gestures of cooperation during the pandemic (such as through resource and vaccine sharing) are apt examples of soft power diplomacy, and meet the targets of SDG 3 (good health and wellbeing) and SDG 9 (industry, innovation and infrastructure).

#### Warming causes extinction and turns their impacts - death spirals make resilience impossible.

Beard et al. 21 [S.J. Beard, Lauren Holt, Asaf Tzachor, Luke Kemp, Shahar Avin, Phil Torres, and Haydn Belfield, \* Centre for the Study of Existential Risk, “Assessing climate change’s contribution to global catastrophic risk,” 2021, *Futures*, Vol. 127, https://doi.org/10.1016/j.futures.2020.102673, EA – Table 1 & Fig. 2 Omitted]

3.1. Climate change and planetary boundaries

While most of the impacts of climate change so far have fallen within the range of what was experienced during the Holocene, the rate of change is faster than in the Holocene and we are now beginning to see climate change push beyond these boundaries. In the latest edition of the planetary boundaries’ framework, climate change is placed in the zone of increasing risk, implying that while this boundary has been breached, there remains some potential for normal functioning and recovery (Steffen et al., 2015). It thus lies between what the authors identify as the ‘safe zone’ and other ‘high risk’ transgressions, such as disruption to the biochemical flows of nitrogen and phosphorus and loss of biosphere integrity.

As part of their discussion of BRIHN Baum and Handoh (2014) note that climate change is the planetary boundary for which the risk to humanity has received most meaningful consideration and they suggest that this attention is deserved. Yet little research attention has been paid to climate change’s extreme or catastrophic effects. Kareiva and Carranza (2018) argue that, despite currently falling outside of the area of high risk, climate change has the clear potential to push humanity across a threshold of irreversible loss by “changing major ocean circulation patterns, causing massive sea-level rise, and increasing the frequency and severity of extreme events… that displace people, and ruin economies.” Even if humanity was resilient to each of these individual impacts, a global catastrophe could occur if these impacts were to occur rapidly and simultaneously.

One scenario that has received comparatively more attention is that of the global climate crossing a tipping point that would trigger environmental feedback loops (such as declining albedo from melting ice or the release of methane from clathrates) and cascading effects (such a shifting rainfall patterns that trigger desertification and soil erosion). After this point, anthropogenic activity may cease to be the main driver of climate change, making it accelerate and become harder to stop (King et al., 2015).

Other scenarios can be discerned from the numerous historical cases in which the modest, usually regional, climatic changes experienced during the Holocene have been implicated in the collapse of previous societies, including the Anasazi, the Tiwanaku, the Akkadians, the Western Roman Empire, the lowland Maya, and dozens of others (Diamond, 2005, Fagan, 2008). These provide a precedent for how a changing climate can trigger or contribute to societal breakdown. At present, our understanding of this phenomena is limited, and the IPCC has labelled its findings as “low confidence” due to a lack of understanding of cause and effect and restrictions in historical data (Klein et al., 2014). Further study and cooperation between archaeologists, historians, climate scientists and global catastrophic risk scholars could overcome some of these limitations by identifying how the impacts of climate change translate into social transformation and collapse, and hence what the impacts of more rapid and extreme climatic changes might be. There is also the potential for larger studies into how global climate variations have coincided with collapse and violence at the regional level (Zhang, Chiyung, Chusheng, Yuanqing, & Fung, 2005; Zhang et al., 2006). However, these need to be interpreted and generalized with care given the differences between pre-industrial and modern societies.

Societies also have a long history of adapting to, and recovering from, climate change induced collapses (McAnany and Yoffee, 2009). However, there are two reasons to be sceptical that such resilience can be easily extrapolated into the future. First, the relatively stable context of the Holocene, with well-functioning, resilient ecosystems, has greatly assisted recovery, while anthropogenic climate change is more rapid, pervasive, global, and severe. Large-scale states did not emerge until the onset of the Holocene (Richerson, Boyd, & Bettinger, 2001), and societies have since remained in a surprisingly narrow climatic niche of roughly 15 mean annual average temperature (Xu, Kohler, Lenton, Svenning, & Scheffer, 2020). A return to agrarian or hunter-gatherer lifestyles could thus have more devastating and long-lasting effects in a world of rapid climate change and ecological disruption (Gowdy, 2020).7 Second, modern human societies may have developed hidden fragilities that amplify the shocks posed by climate change (Mannheim 2020) and the complex, tightly-coupled and interdependent nature of our socio-economic systems makes it more likely that the failure of a few key states or industries due to climate change could cascade into a global collapse (Kemp, 2019).

A third set of plausible scenarios stem from climate change’s broader environmental impacts. Apart from being a planetary boundary of its own, Steffen et al. (2015) point out that climate change is intimately connected with other planetary boundaries (see Table 1). Climate change is thus identified by the authors as one of two ‘core’ boundaries with the potential “to drive the Earth system into a new state should they be substantially and persistently transgressed.” This transformative potential was elaborated on in subsequent work exploring how the world could be pushed towards a ‘Hothouse Earth’ state, even with anthropogenic temperature rises as low as 2 °C (Steffen et al., 2018).

The connection between climate change and biosphere integrity (the survival of complex adaptive ecosystems supporting diverse forms of life) is particularly strong. The IPCC is highly confident that climate change is adversely impacting terrestrial ecosystems, contributing to desertification and land degradation in many areas and changing the range, abundance and seasonality of many plant and animal species (Arneth et al., 2019). Similarly, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has reported that climate change is restricting the range of nearly half the world’s threatened mammal species and a quarter of threatened birds, with marine, coastal, and arctic ecosystems worst affected (Diaz et al., 2019). According to one estimate, climate change could cause 15–37 % of all species to become ‘committed to extinction’ by mid-century (Thomas et al., 2004).

Disruption to biosphere integrity can have profound economic and social repercussions, ranging from loss of ecosystem services and natural resources to the destruction of traditional knowledge and livelihoods. For instance, desertification, which threatens a quarter of Earth’s land area and a fifth of the population, is already estimated to cost developing nations 4–8 % of their GDP (United Nations, 2011). Many other rapid regime shifts involving loss of biosphere integrity have been observed, including shifts in arid vegetation, freshwater eutrophication, and the collapse of fish populations (Amano et al. 2020). There is a theoretical possibility of still more profound regime shifts at the global level (Rocha, Peterson, Bodin, & Levin, 2018). However, the contribution of loss of biosphere integrity to GCR is yet to be assessed. Kareiva and Carranza (2018) argue that it is unlikely to threaten human civilization, due both to a lack of plausible mechanisms for this threat and the fact that “local and regional biodiversity is often staying the same because species from elsewhere replace local losses.” However, in their classification of GCRs, Avin et al. (2018) suggest the potential for ecological collapse to threaten the safety boundaries of multiple critical systems with diverse spread mechanisms at a range of scales, from the biogeochemical and anatomical to the ecological and sociotechnological. Note that both these studies were conducted for largely conceptual purposes and should not be taken as rigorous analyses of this risk, this topic warrants further investigation.

3.2. Classifying climate change’s contributions to global catastrophic risk

Climate change’s contribution to GCR goes well beyond its impact on the earth system. Taking Avin et al.’s list of critical systems, we note that previous studies have mostly focused on the effects of climate change on physical and biogeochemical systems (e.g. global temperature and sea-level rise) or the lower-level critical systems that are most directly related to human health and survival (e.g. Heath Stress). However, these represent a very limited assessment of risk as it only accounts for climate change as a direct hazard/ threat and our "ontological" vulnerabilities to it. A more comprehensive risk assessment must consider the higher-order critical systems threatened by climate change passively (through a lack of alternatives) and actively (through intentional design).

The probability of a global catastrophe is higher when sociotechnological and environmental systems are tightly coupled, creating a potential for reinforcing feedback loops. If environmental change produces social changes that perpetuate further environmental change, then this could actively work against our efforts at adaptation. When this change has the potential to produce significant harm, via human vulnerabilities and exposure, we describe such loops as ‘global systems death spirals.’ These spirals could produce self-perpetuating catastrophes, whereby the energy and resources required to reverse or adapt to collapse are beyond the means of dwindling human societies. Feedback loops like this could thus create tipping points beyond which returning to anything like present conditions would become extremely difficult. Global systems would shift to very different states in which the prospects for humanity would likely be bleaker.

In the rest of this section, we explore just one potential spiral, between an ecological system (the biosphere) and two sociotechnological systems (the human food and global political systems). We explore each system and its interactions. Fig. 2 illustrates our model of this spiral.

3.2.1. The human food system

Climate change’s impact on biosphere integrity (discussed in the previous section) could harm the human food system due to loss of ecosystem services, disruption of the cycles of water, nitrogen and phosphates, and changes in the dynamics of plant and animal health (B´elanger & Pilling, 2019). Crossing this planetary boundary is already having severe implications for global food security, including loss of soil fertility and insect-mediated pollination (Diaz et al., 2019).

Systems for the production and allocation of food are already enduring significant stress. The sources of stress include climate change, soil erosion, water scarcity, and phosphorus depletion. The natural resource base, arable land and freshwater upon which food production rely are being degraded. While global food productivity and production has increased dramatically over the past century to meet rising demand from an expanding global population and rising standard of living, these constraints and risks are increasing the vulnerability of our global food supply to rapid and global disruptions that could constitute global catastrophes (Baum, Denkenberger, Pearce, Robock, & Winkler, 2015).

Climate change will further reduce food security in at least three interconnected ways. First, it will affect growing conditions, including direct threats to agricultural yields from heat, humidity, and precipitation in many regions; although initially improving conditions in some (Lott, Christidis, & Stott, 2013). Second, it will increase the range of agricultural pests and diseases (Harvell et al., 2002). Third, it will increase the occurrence of extreme weather events that impair the integrity of food production and distribution networks, from production to harvest, post-harvest, transport, storage, and distribution, thereby increasing our vulnerability and exposure to supply shocks (Bailey et al., 2015). The IPCC estimates, with medium confidence, that at around 2 °C of global warming the risk from permafrost degradation and food supply instabilities will be ‘very high’, while at around 3 °C of global warming the risk from vegetation loss, wildfire damage, and dryland water scarcity will also be very high (Arneth et al., 2019). Very few studies have considered the impacts of 4 °C of global warming or more; however, the IPCC highlighted one study finding that any potential agricultural gains from climate change will be lost by this point and there could be a decrease of 19 % in maize yields and 68 % in bean yields in Africa, an 8 % reduction in yields in South Asia, and a substantial negative impact on fisheries by 2050 (Porter et al., 2014). Furthermore, multiple extreme weather events could disrupt food distribution networks (Bailey and Wellesley, 2017).

While there are opportunities to adapt, disruption to the entire global food system cannot be resolved via food aid alone. Indeed, there is the potential for isolationist or heavy-handed responses that would do more harm than good. Given the high degree of interconnectivity and feedback within the global food system, our initial research suggests that any one of these climate change effects could trigger scenarios that would critically undermine the global food system’s ability to meet the minimum nutrition for well-being; making food security for all an unachievable goal, let alone rise to the challenge of continuing to grow (A. Tzachor, 2019, 2020); this would constitute what Kuhlemann (2019) terms a ‘threshold of significance.’

3.2.2. The global political system

Disrupting the global food system can create and exacerbate conflict and state failure (Brinkman & Hendrix, 2011). However, once again, this needs to be seen against the backdrop of a global political system under stress, with climate change as a significant contributing factor. Climate change influences political systems in many ways, from being a locus of activism and a stimulus for reform to driving rising inequality and population displacement (Arneth et al., 2019; Diffenbaugh & Burke, 2019). This is not a new phenomenon, changes in the climate are believed to have contributed to conflict between people and states throughout human history, driven by resource scarcity, population displacement, and inequality (Lee, 2009; Mach et al., 2019). As part of a comprehensive risk assessment of climate change, King et al. (2015) conducted an extensive literature review on climate change and conflict and used this to inform a series of international wargaming exercises. These found that climate change is expected to increase international conflict while highlighting the role that population displacement, state failure, and water and food insecurity would play in this (see also Mach et al., 2019; Natalini, Jones, & Bravo, 2015).

Quantitative studies of the impact of climate change on violence and conflict have provided more mixed results. A survey of empirical studies by Detges (2017) found that there may be multiple differing trends: extreme weather events appear to have more significant effects on violence than do long-term climate trends, while levels of small-scale conflict and interpersonal violence appear to be more affected than large-scale conflicts and international war. Empirical studies also highlight how climate change’s impact on conflict is predominantly as a risk multiplier and intensifier. Thus, climate change may contribute more by increasing our vulnerability to other conflict-inducing factors, such as loss of livelihood, forced migration, environmental change, and food insecurity, than by acting as a direct cause of conflict (Abel, Brottrager, Cuaresma, & Muttarak, 2019; Hsiang, Burke, & Miguel, 2013; Schubert et al., 2008).8

Of particular relevance to GCR is the effect of climate change on the risk of nuclear war (Parthemore, Femia, & Werrell, 2018). However, to our knowledge, this has never been rigorously assessed, although the potential is certainly there. One recent model of the risk of nuclear war highlighted how varied, and common, incidents with the potential to trigger a nuclear exchange are (Baum, de Neufville, & Barrett, 2018). It outlined 14 different causal pathways to an exchange, including the escalation of conventional wars and international crises, human error, and the emergence of new non-state actors. For all but two of these, they identify historical examples of potentially precipitating incidents, with 60 incidents in total (i.e. a little less than one a year). This suggests that the absence of nuclear war was less due to a lack of potential causes, tan the global political system’s ability to defuse them. Thus, the real significance of climate change may be its capacity to undermine this system: the combination of social, political, and environmental disruption, a lingering sense of global injustice, and rising food, water, and energy insecurity could increase the probability that crises escalate or that false alarms are mistaken for genuine emergencies. This topic needs further research.

3.3. The emergence of a global systems death spiral

Yet, we should not conclude that a nuclear exchange is the only, or even most likely, scenario in which political instability might produce a global catastrophe. Conflict and political instability, even of moderate severity, are themselves two of the most significant drivers of biodiversity loss due to breakdowns in monitoring, governance, and (public and private) property rights (Baynham-Herd, Amano, Sutherland, & Donald, 2018). This closes a potentially reinforcing feedback loop between loss of biosphere integrity, food insecurity and political breakdown.

The mechanisms by which these cascading failures might spread include many of the natural, anthropogenic, and replicator effects identified by Avin et al. (2018), making them harder to contain. At the natural level, climate change involves changes to the global atmospheric and biogeochemical systems and poses other naturally spreading harms, like global ecological collapse. At the anthropogenic level, the global interconnectedness of sociotechnological systems means that while small shocks are easier to recover from, larger shocks can be harder to contain and control. Finally, biological and informational replication can also spread the negative impacts of climate change, from vector-borne diseases and invasive species to climate fatalism and dangerous geoengineering technologies.

Given these numerous spread mechanisms, critical system failures could precipitate global catastrophes. Furthermore, the spiral we have explored is unlikely to be the only set of interlinked systemic disruptions that climate change could initiate (other death spirals could involve bio-insecurity and disease), nor are these the only causal connections between these three systems. Until we understand the nature of such death spirals better, we must act cautiously. We now turn to consider what this would mean.

## On

### LBL

#### 100%

### Debris

#### Probability – 0.1% chance of a collision.

Salter 15 – Assistant Professor of Economics & Comparative Economics Research Fellow at Texas Tech University

Alexander W. Salter, Space Debris: A Law and Economics Analysis of the Orbital Commons, Mercatus Working Paper, Mercatus Center at George Mason University, 19 STAN. TECH. L. REV. 221 (2016), <https://law.stanford.edu/wp-content/uploads/2017/11/19-2-2-salter-final_0.pdf>

\*numbers replaced with English words

The probability of a collision is currently **low**. Bradley and Wein estimate that the **maximum probability** in LEO of a collision over the lifetime of a spacecraft remains **below one in one thousand**, conditional on continued compliance with NASA’s deorbiting guidelines.3 However, the possibility of a future “snowballing” effect, whereby debris collides with other objects, further congesting orbit space, remains a significant concern.4 Levin and Carroll estimate the average immediate destruction of wealth created by a collision to be approximately $30 million, with an additional $200 million in damages to all currently existing space assets from the debris created by the initial collision.5 The expected value of destroyed wealth because of collisions, currently small because of the low probability of a collision, can quickly become significant if future collisions result in runaway debris growth.

### Space War

#### No Space War -

#### 1] Redundancy – their ev is hysteria

Johnson-Freese and Hitchens ‘16

Johnson-Freese and Hitchens 16 [Dr. Joan Johnson-Freese is a member of the Breaking Defense Board of Contributors, a Professor of National Security Affairs at the Naval War College and author of Space Warfare in the 21st Century: Arming the Heavens. Views expressed are those of the author alone. Theresa Hitchens is a Senior Research Scholar at the Center for International and Security Studies at Maryland (CISSM), and the former Director of the United Nations Institute for Disarmament Research (UNIDIR) in Geneva, Switzerland. Stop The Fearmongering Over War In Space: The Sky’s Not Falling, Part 1. December 27, 2016. https://breakingdefense.com/2016/12/stop-the-fearmongering-over-war-in-space-the-skys-not-falling-part-1/

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

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

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

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

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

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

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

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

The Reality

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

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

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

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

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

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

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

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

#### 2] Ground stations are easier to attack

Cooper et al 17 [Zack Cooper is a fellow with the Asia team at the Center for Strategic and International Studies. Dr. Cooper previously served in the Pentagon and White House, and received his PhD in security studies from Princeton University. Escalation & Deterrence in the Second Space Age. https://csis-prod.s3.amazonaws.com/s3fs-public/publication/171109\_Harrison\_EscalationDeterrenceSecondSpaceAge.pdf]

Rather than attacking the satellites on-orbit, an adversary could achieve similar effects by attacking the ground stations that support them. Ground stations are perhaps more vulnerable to attack, because they are often highly visible, located in foreign countries, and relatively soft targets. For military communications satellites, the data transmitted to and from forward-deployed users is often sent via satellite to a teleport ground station, where it is relayed through another satellite or terrestrial networks to users around the world. To reduce the dependence on ground stations, some military space systems use inter-satellite links to transmit data directly between satellites without passing through an intermediary ground station.

Ground stations are vulnerable to kinetic physical attack by several means. Guided missiles and rockets can be used to attack ground stations from range, while rocket-propelled grenades and small arms fire can be used to disable ground station antennas at close range. Ground stations can also be disrupted by attacking the electrical power grid, water lines, and the high-capacity communications lines that support them. While attacks against ground stations could have large implications, the effects would not be permanent. Unlike satellites, which require years to build and often cannot be repaired once they are launched, ground stations can be repaired in a matter of days or weeks, depending on the level of damage incurred.

### No Sovereignty

#### No space PTD – no sovereignty.

Jonckheere, 18 – Master’s Dissertation on Public and International Law, Evarist Ghent University.

(Evarist Jonckheere, reviewed by Maes Frank and René Oosterlinck, professors at Evarist Ghent University, “The Privatization of Outer Space and the Consequences for Space Law”, May 2018)

b. Application of the Principle: The Public Trust Doctrine

66. Public trust.

121 The common heritage of mankind principle has been applied throughout history in the form of the ‘public trust’ doctrine.122 However, this application is problematic in outer space.

The doctrine proposes that states possess all the property rights of the common areas. While these states remain the owners, they can subsequently convey usage rights of the property to its residents – possibly private enterprises. This results in a division between the rights of the state and the rights conveyed to its residents. Both parties have their own interests in owning the area and using its resources, but the state’s interest is the primary concern.

Article I of the Outer Space Treaty seemingly creates such a public trust situation. However, states do not have the purposed sovereignty over outer space that is necessary in the public trust doctrine. Sovereign control over real property by a state is needed before any rights can be conferred to private actors. States do not have this control in outer space and as a result, states would not be able to recognize private ownership there.

### Causes Judicial Infighting

#### No risk of a turn – PTD on climate change sparks MASSIVE judicial infighting and threatens the court’s institutional capital

Lazarus 15 (Richard, Prof of Law @ Harvard, "JUDICIAL MISSTEPS, LEGISLATIVE DYSFUNCTION, AND THE PUBLIC TRUST DOCTRINE: CAN TWO WRONGS MAKE

IT RIGHT?," http://www.law.harvard.edu/faculty/rlazarus/docs/articles/LazarusRJJudicialMisstepsLegislativeDysfunctionAndThePTDFinalArticleEnvtLawDec2015.pdf)

But imagine what would be required for climate change in light of its extraordinary temporal and spatial scope of cause and effect, and the corresponding complexity of the technological, economic, and social judgments that must be made in determining how to address the climate issue. The courts would be asked to embrace a judicial role that assigns them the primary responsibility of deciding the appropriate levels of greenhouse gas emissions in the United States. They would be asked to set legal rules governing how those emissions should then be allocated and when different levels would need to be achieved. The courts would have to develop the equivalent of the President’s proposed Clean Power Plan. As evidenced by the plan itself, consider the sweep of activities that would be affected over both time and space. Consider, too, the fundamental social and economic policy judgments that courts would have to make. The courts do not remotely possess the necessary competence or lawmaking legitimacy to answer those kinds of questions. And they will decline to do so, especially in the absence of any kind of clear constitutional command. Conservative judges would not favor it. And one would be hard pressed to find many liberal judges who would, no matter how much they agreed climate change was an enormous problem.101 And, even if one finds an isolated judge or two so exceedingly frustrated by the lack of governmental action to address climate change, the half-life of their ruling will likely be limited upon further view. The bottom line is that this is just not how we make laws of this nature under our constitutional framework.

### US Heg Turn

#### Separation of powers and rule of law key to American democracy

Bass 18**.** [Idaho Falls Post Register April 30, 2018 Monday Copyright 2018 The Post Register All Rights Reserved Length: 450 words Byline: Hillarie Bass, Writer, ABA President Dateline: Idaho Falls, ID] gac, reformatted armaan 🏎️

James Madison knew a bad thing when he saw it: It is dangerous, he warned, to give any one person or institution too much power. But in these turbulent times, the separation of powers**- a foundation of American democracy -**is a concept this country is perilously close to forgetting**.** In one of his most famous Federalist papers, Madison warned in 1788 that the structure of the new U.S. government was crucial to ensuring "the proper checks and balances" between competing branches. The concept of separation of powers was thus **enshrined in the U.S. Constitution.**A breakdown of the separation of powers can manifest itself in many ways. The legislative branch might fail to provide effectively oversight of the executive branch. Our lawmakers might launch personal attacks on judges after rulings they disagree with. The balance could also be swayed if the executive branch circumvents the lawmaking duties of Congress, or when legislators seek to slash judges' pay - or even try to impeach them - because courts hand down unfavorable decisions. Unfortunately, much of our citizenry is ignorant of the concept of separation of powers. A 2016 Annenberg Public Policy poll found that only 26 percent of Americans can even name the three branches of government. At the American Bar Association, one of our most important jobs is ensuring that all citizens understand the rule of law that underlies our democracy**.** May 1 is Law Day in the United States, and this year the theme is the separation of powers. On Law Day, lawyers across the country will gather in schools and civic centers to teach students and adults the importance of this concept. State and local bar associations will hold hundreds of events. Students from California to the Carolinas will write essays, create posters and make videos. Many colleges will bring in high school students for workshops. Many bar associations will honor people who promote a better understanding and respect for the rule of law. Our constitutional framers understood that too much power amassed by one group or one person, without appropriate checks in place, would destroy the balance**that protects the framework**of our democracy. The separation of powersexists to control the power of government - especially in tumultuous times. It underpins our democracy. The consequences of forgetting this principle is as clear today as when Madison issued his warning: A disintegration of the checks and balances among the three branches of government could be catastrophic for our democracy.

#### Expanding PTD replaces the rule of law with the rule of the judge — that gives courts unlimited and unchecked discretion

Huffman 16 — [James L. Huffman is an American historian, a former professor of law and the former dean of Lewis & Clark Law School. (“Protecting the Great Lakes: The Allure and Limitations of the Public Trust Doctrine.” University of Detroit Mercy Law Review, vol. 93, no. 2, University of Detroit Mercy School of Law, 2016, p. 239.)] ZW, reformatted armaan 🏎️

Implicit in each of the foregoing reasons for respecting the historic limits of the public trust doctrine is that failure to do so violates the rule of law. Judicial respect for the rule of law does not mean that courts lack authority to adapt the law in light of changing circumstances. But, as the distinction between demand-side and supply-side understandings of the judicial role underscores, it is one thing to adapt the law so that its purposes can be realized and a different thing entirely to adapt the law so that different purposes might be achieved-no matter how meritorious those different objectives. The latter approach, rooted in the supply-side view that judges should be attentive to public needs and should rewrite the law accordingly, positions the judge as lawmaker in the context of particular disputes. This is the rule of the judge, not the rule of law**.**In her comment lamenting the Wisconsin Supreme Court's decision in Rock-Koshkonong Lake District, Anne-Louise Mittal offers a clear, supplyside critique. She writes, "[the] decision undermines the particular adaptability of Wisconsin's public trust doctrine, which has allowed the

[Footnotes Omitted]

doctrine to evolve along with societal values and public needs and which, for decades, has situated Wisconsin as a leader in using the public trust doctrine for environmental protection." 142 Dissenting Justice Crooks asserts that the majority in that case "attempts to undermine this court's precedent, recharacterize its holdings, and rewrite history.' 4 3 It is certainly possible to have precedent that allows for judicial flexibility in the interpretation of a particular doctrine, but is such precedent consistent with the rationale of the rule of law? Imagine a hypothetical judicial holding that courts of original jurisdiction have unlimited discretion to accept or reject cases. Would adherence to this precedent be consistent with the rule of law? Of course not. There can be no rule of law without access to an independent arbiter. Or, imagine a hypothetical judicial holding that courts have unlimited discretion to override legislative declarations of the public interest. Would adherence to this precedent be consistent with the rule of law? Of course not. Adherence to precedent does not, by itself, constitute the rule of law. If the principle of a particular precedent rejects the rule of law, adherence to that precedent cannot somehow constitute the rule of law. It is true that the public trust jurisprudence emanating from the Wisconsin Supreme Court prior to its Rock-Koshkonong Lake District ruling recognized wide discretion in the courts to expand the reach of the doctrine with respect to both geography and protected uses. It is also true, however, that these expansions effectively took property from individuals whose reasonable expectations, founded in the state's property laws, were that the public had no rights in their property. By relying on the public trust doctrine, the Wisconsin courts were able to contend that, notwithstanding their expectations, offended property owners never had the rights they claimed were taken by the state's expansion of the public trust doctrine. But, this cannot be consistent with the rule of law. Along the lines of the earlier hypothetical judicial holding, imagine a law, judicially declared or statutorily enacted, providing that property owners may do as they please with their property subject to the unlimited discretion of the state to restrict use of private property. Would judicial adherence to such a rule be consistent with the rule of law? Of course not. A property right thus guaranteed would be no right at all. Enforcing such a rule as precedent would be a mockery of the rule of law**.**

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