## 1NC

### 1NC – T – Private Entities

#### Interpretation: “Private entities” is a generic bare plural. The aff may not defend that a subset of nations ban the appropriation of outer space.

Nebel 19. [Jake Nebel is an assistant professor of philosophy at the University of Southern California and executive director of Victory Briefs. He writes a lot of this stuff lol – duh.] “Genericity on the Standardized Tests Resolution.” Vbriefly. August 12, 2019. <https://www.vbriefly.com/2019/08/12/genericity-on-the-standardized-tests-resolution/?fbclid=IwAR0hUkKdDzHWrNeqEVI7m59pwsnmqLl490n4uRLQTe7bWmWDO_avWCNzi14> TG

Both distinctions are important. Generic resolutions can’t be affirmed by specifying particular instances. But, since generics tolerate exceptions, plan-inclusive counterplans (PICs) do not negate generic resolutions.

Bare plurals are typically used to express generic generalizations. But there are two important things to keep in mind. First, generic generalizations are also often expressed via other means (e.g., definite singulars, indefinite singulars, and bare singulars). Second, and more importantly for present purposes, bare plurals can also be used to express existential generalizations. For example, “Birds are singing outside my window” is true just in case there are some birds singing outside my window; it doesn’t require birds in general to be singing outside my window.

So, what about “colleges and universities,” “standardized tests,” and “undergraduate admissions decisions”? Are they generic or existential bare plurals? On other topics I have taken great pains to point out that their bare plurals are generic—because, well, they are. On this topic, though, I think the answer is a bit more nuanced. Let’s see why.

“Colleges and universities” is a generic bare plural. I don’t think this claim should require any argument, when you think about it, but here are a few reasons.

First, ask yourself, honestly, whether the following speech sounds good to you: “Eight colleges and universities—namely, those in the Ivy League—ought not consider standardized tests in undergraduate admissions decisions. Maybe other colleges and universities ought to consider them, but not the Ivies. Therefore, in the United States, colleges and universities ought not consider standardized tests in undergraduate admissions decisions.” That is obviously not a valid argument: the conclusion does not follow. Anyone who sincerely believes that it is valid argument is, to be charitable, deeply confused. But the inference above would be good if “colleges and universities” in the resolution were existential. By way of contrast: “Eight birds are singing outside my window. Maybe lots of birds aren’t singing outside my window, but eight birds are. Therefore, birds are singing outside my window.” Since the bare plural “birds” in the conclusion gets an existential reading, the conclusion follows from the premise that eight birds are singing outside my window: “eight” entails “some.” If the resolution were existential with respect to “colleges and universities,” then the Ivy League argument above would be a valid inference. Since it’s not a valid inference, “colleges and universities” must be a generic bare plural.

Second, “colleges and universities” fails the [upward-entailment test](https://plato.stanford.edu/entries/generics/#IsolGeneInte) for existential uses of bare plurals. Consider the sentence, “Lima beans are on my plate.” This sentence expresses an existential statement that is true just in case there are some lima beans on my plate. One test of this is that it entails the more general sentence, “Beans are on my plate.” Now consider the sentence, “Colleges and universities ought not consider the SAT.” (To isolate “colleges and universities,” I’ve eliminated the other bare plurals in the resolution; it cannot plausibly be generic in the isolated case but existential in the resolution.) This sentence does not entail the more general statement that educational institutions ought not consider the SAT. This shows that “colleges and universities” is generic, because it fails the upward-entailment test for existential bare plurals.

Third, “colleges and universities” fails the adverb of quantification test for existential bare plurals. Consider the sentence, “Dogs are barking outside my window.” This sentence expresses an existential statement that is true just in case there are some dogs barking outside my window. One test of this appeals to the drastic change of meaning caused by inserting any adverb of quantification (e.g., always, sometimes, generally, often, seldom, never, ever). You cannot add any such adverb into the sentence without drastically changing its meaning. To apply this test to the resolution, let’s again isolate the bare plural subject: “Colleges and universities ought not consider the SAT.” Adding generally (“Colleges and universitiesz generally ought not consider the SAT”) or ever (“Colleges and universities ought not ever consider the SAT”) result in comparatively minor changes of meaning. (Note that this test doesn’t require there to be no change of meaning and doesn’t have to work for every adverb of quantification.) This strongly suggests what we already know: that “colleges and universities” is generic rather than existential in the resolution.

#### It applies to “private entities” – 1] upward entailment test – “appropriation of outer space by private entities is unjust” doesn’t entail that all entities ought to ban private entities because public entities don’t, 2] adverb test – adding “generally” to the res doesn’t substantially change its meaning because a ban is universal.

#### Precision o/w – anything else justifies the aff arbitrarily jettisoning words in the resolution at their whim which decks negative ground and preparation because the aff is no longer bounded by the resolution.

#### Violation – They specified China

#### Standards:

1] **Limits and ground – their model allows affs to defend any combination of private entities in any countries which explodes negative burden and causes random affs every tournament**

#### 2] TVA solves: Read the plan as an advantage under a whole rez – PICs don’t solve because potential neg abuse doesn’t justify aff abuse

Fairness is a voter – debate’s a game that needs rules to evaluate it and answers to it rely on the judge evaluating the argument fairly

No RVIs: a. Chills theory – If people know they might lose for reading theory, it will disincentivize them. b. You don’t get to win by being fair.

Use competing interpretations: a. Reasonability causes a race to the bottom with testing the limit of it b. collapses – de ate abspecified briteline

Drop the debater: for being abusive – we can’t restart the round from the 1AC and I’m skewed for the rest of the debate.

### 1NC – T – Tropicality

#### Interpretation: the affirmative must use a lens of tropicality. It’s a prerequisite to ethical space policy discussion.

#### Violation: Vote neg - They don’t forefront a critical geography framing—that reproduces destructive colonial violence against the equatorial margins.

Dunnett, 19—Department of Geography, School of Natural and Built Environment, Queen’s University Belfast (Oliver, “Imperialism, Technology and Tropicality in Arthur C. Clarke’s Geopolitics of Outer Space,” Geopolitics, January 31, 2019, dml)

Approaching concepts of outer space, geopolitics and science through Arthur C. Clarke first requires a broader discussion of relevant debates in postcolonial studies, science and technology studies, and historical geography. Synthesising some of these themes, the anthropologist Peter Redfield’s study of the European space programme aimed to ‘recombine elements of imaginative discourse with technical practise, tracing the trajectory of adventure as it leaves the planet, and highlighting the historical geography of power that runs through the Final Frontier’ (Redfield 2002, 792). This empirically rich work provides a sound theoretical basis for exploring the cultural and political roots of spaceflight in the late modern era, while taking seriously imaginative representations of outer space. Existing studies of outer space in this period have mostly examined, by contrast, the social and cultural ‘impacts’ of the better-known American and Soviet/Russian space programmes, in the geopolitical context of the Cold War (Dick and Launius 2007; Parker and Bell 2009). Redfield connects outer space and empire in two ways: Firstly, through analysing the imaginative geographies of exploration, conquest and adventure that have long characterised spaceflight narratives, and second, in examining the colonial status of the European Space Agency launch site in French Guiana in South America, home of the Ariane satellite launcher rocket since 1979. Other researchers have considered rocket sites in colonial locations such as Hammaguir in Algeria, launch site of the French satellite Astérix in 1965, and Woomera in South Australia, where the British Blue Streak rocket was tested in the 1960s (Gorman 2009; Instone 2010). The development of these sites as centres of imperial techno-science notably came at a time when European empires were disintegrating in spaces across the world, and thereby make effective case studies for examining late-modern connections to the empire of outer space.

An integral argument in critical studies of spaceflight is that space exploration represents a modernist dream that acts as a continuation of empire, implicating discourses of technology-as-progress. In this respect, historian Michael Adas has explained how, in the industrial era, science and technology were seen as ‘measures of human worth’, justifying European colonialism while also acting as the means through which imperial power was exercised (Adas 1989, 3). This pattern has been noted in accounts of technological determinism that frequently characterise narratives of space exploration. For example, the American space programme of the 1960s, specifically Project Apollo, is said to have exemplified and helped proliferate ‘technocratic’ modes of governance in the United States, typified by ‘a utopian attitude towards technology’ as a solution to all the world’s problems (Sage 2014, 57). More recently, ‘NewSpace’ magnates such as Elon Musk and Jeff Bezos have enrolled the language of utopian technological futurism to promote ambitious space ventures such as the colonisation of Mars (SpaceX 2018). Such framings have been described as ‘depressingly ubiquitous’ in portrayals of so-called ‘frontier technologies’, adding to debates on the extent to which technology can be seen as culturally and politically produced, rather than naturalised as a harbinger of progress and modernity (Bingham 2005, 202; Jasanoff and Kim 2015). Critics have typically rejected technological determinism as an effective explanation of societal development, drawing on postmodernist accounts that define a role for the social construction of science and technology (Shapin and Schaffer 1985). Indeed, researchers have demonstrated how spaceflight technology did not emerge naturally at any given place or time, with political and cultural factors influencing substantial geographical and historical disparities in its development (Winter 1983). Further studies have effectively outlined how various popular cultures, including science fiction novels, astronomical art and the public spectacle of rocketry, worked as integral parts of the wider discourse of twentieth-century outer space technology (MacDonald 2008; Redfield 2002; Sage 2008).

Adding further nuance to debates on the relationship between technology and culture, Redfield explains how a combination of political, cultural and geophysical factors led to the selection of French Guiana as the home of the European Space Agency’s rocket launch facility in the early 1970s (Redfield 2000). Notwithstanding its history as part of the French imperial sphere of influence, French Guiana’s significance for European spaceflight operations lies with its geographical location near to the equator, and its eastward-facing coastline. This is because, firstly, equatorial sites benefit from the maximum ‘latitudinal boost’ resulting from the centrifugal forces of the earth’s rotation, and, second, the Atlantic Ocean is made available as a vast testing range, where spent rockets can safely crash back down into the open seas. Furthermore, the equatorial region becomes prized in the geography of spaceport site selection because of its alignment with the prime ‘real estate’ of the geosynchronous orbit, located along a band in space 36,000 km above the earth’s equator (Collis 2009). As Clarke illustrated in 1945, satellites placed in this orbit attain specific value as they remain fixed above any given point on the earth’s equatorial belt, and can thereby be used for reliable global communications services (Clarke 1945). This new perspective was officially recognised in the 1976 Bogotá Declaration, which stated that ‘[t] he geostationary orbit is a scarce natural resource’, over which equatorial states should have national sovereignty (Bogotá Declaration 1976). While signed by a consortium of equatorial states, the declaration remains unratified by the United Nations, highlighting the unequal power geometries involved in outer space geopolitics. Such concerns demonstrate how the study of space launch sites, both actual and anticipated, presents opportunities for researchers interested in the intersections between science and technology studies, critical geopolitics and cultural-historical geographies of the tropical region.

Indeed, while equatorial sites have their own unique advantages for the space industry, postcolonial scholars have demonstrated how tropical spaces have been assigned particular characteristics, drawing on a wider body of work that has addressed the complicity of western culture in discourses of empire (Pratt 1992; Said 1993). Such characteristics relate to opportunities for adventure, the presence of bountiful natural resources, and the danger and excitement of exotic allure. For Richard Phillips, ‘European empires and European masculinities were imagined in geographies of adventure’ in children’s novels such as Daniel Defoe’s Robinson Crusoe (1719), famously set on a fictitious tropical island (Phillips 1997). Twentieth century imaginative spaces of adventure have also been interpreted in relation to geographies of empire, whether in relation to historical figures like T E Lawrence, or fictional archetypes such as James Bond or Tintin (Dawson 1994; Dodds 2003; Dunnett 2009). According to Graham Dawson, ‘the modern adventure tale is imbued with the imaginative resonance of colonial power relations underpinned by science and technology’, while at the same time, adventure becomes ‘balanced with anxiety and desire’ in the colonial context (Dawson 1994, 59, 53). The adventure genre and its associated tropes remain closely connected to narratives of space exploration, as seen in examples such as the 1964 feature film Robinson Crusoe on Mars, or Andy Weir’s 2014 novel The Martian and subsequent film release, whose extra-terrestrial spaces are represented through a combination of masculine endeavour and exotic encounter (Crossley 2010).

Beyond generic conceptions of adventure, research in cultural and historical geography has drawn on the concept of ‘tropicality’ as a way of understanding certain representations and experiences of tropical spaces, that also relate to wider cosmographic frameworks (Arnold 2000). As Denis Cosgrove reminds us, ‘the originating tropics [of Cancer and Capricorn] are celestial rather than terrestrial markers within a geocentric cosmos’ (Cosgrove 2005, 199). They comprise two great circles that delineate the equatorial band of the earth where the sun passes through the zenith directly above at least once a year, as defined by the earth’s axial tilt. It is the interplay between this cosmographic definition of the tropics, and ethnographic and biological understandings of the tropics, which has defined notions of tropicality in the western world. Such framings can be traced to medieval notions of an equatorial ‘torrid zone’ as part of a Ptolemaic theory of world climatic regions (Cormack 1994). While being considered a barrier to human (European) civilization, the equatorial zone has also been seen as a realm where ‘the superabundance of nature was believed to overwhelm human endeavour’ (Leys Stepan 2001, 18). Yet as voyages of discovery opened up previously unencountered spaces to European experience and representation, imaginative geographies of the tropics persisted. Some, for example, have associated ‘paradisal geographies’ with ‘New World islands … as the location of peoples as yet unfallen and as sites of natural richness’ (Withers 1999, 84). Others have recognised the ways in which ‘tropicality has frequently served as a foil to temperate nature’, or as a ‘site for European fantasies of self-realisation’ (Driver and Martins 2005, 3, 4). Tropical spaces have also been associated with forms of modernity, whether in relation to early modern voyages of discovery, or in ‘modernist abstraction[s] of nature’ in twentieth century landscape designs (Leys Stepan 2001, 210). This paper adapts cultural and cosmographical readings of tropicality in the context of late-imperial techno-science to consider a concept of ‘cosmological tropicality’, a sense in which tropical spaces are more intimately aligned with the heavenly movements of the cosmos, and therefore could hold the key to the future of space exploration.

Geographers Felix Driver and Luciana Martins have argued that understandings of tropicality have been largely framed through ‘projections’ of imagined geographies, and that researchers should attempt to understand such representations as they have been produced, negotiated or contested (Driver and Martins 2005, 5). Touching on similar themes, Gerry Kearns’ research on the late-nineteenth-century travels of Mary Kingsley and Halford Mackinder in colonial Africa has investigated the ways in which personal encounters and travel experiences helped shape the identities of British imperial subjects, informing their broader geopolitical outlooks (Kearns 1997). As such, while Clarke’s projections of Ceylon/Sri Lanka are inherently representational, they also relate closely to the tangible, experienced geographies of his life in Ceylon/Sri Lanka, and present the unusual perspective of a western individual who lived on this island for most of his adult life. In approaching Clarke by thinking through his experiences as well as the representational texts he produced, it becomes possible to engage ‘socio-technical’ understandings of the nuanced relationships between technology, society, representation, discourse and experience. Here, drawing from Bruno Latour’s conception of technology as a social and material construction, Nick Bingham has called for a renewed understanding of socio-technical assemblages ‘between diverse people, non-humans and places’ (Bingham 2005, 201). As such, this paper attempts to understand the extent to which Clarke’s projections of outer space technology were shaped by negotiation with, and experience of, the specific geographies of twentieth century Ceylon/Sri Lanka.

In his aforementioned essay on tropicality, Cosgrove warns that, ‘in rehearsing – even with critical intent – the ways in which Europeans so closely and outrageously have bound tropical ethnography into a mutually deterministic embrace with the physical environments of the tropics, we risk perpetuating the silencing of voices speaking from within tropical space’ (Cosgrove 2005, 198). The same could be said of any account that purports to interpret the visions of one Englishman’s fantasy of space exploration in a tropical ‘paradise’. Yet there remains value in ascertaining the ways in which outer space has been connected to earthly imaginative geographies, and how experiences of particular places have informed geopolitical cultures of outer space. While acknowledging the limitations of such an approach, this paper seeks to investigate the extent to which Clarke’s socio-technical constructions of Ceylon/Sri Lanka were formulated with respect to local culture and politics. Tariq Jazeel has, for example, contested the notion of ‘Sri Lankan island-ness’, explaining how the perceived unity of the Sri Lankan state today can be traced to British imperial rule from 1815 to 1948, before which the island had been made up of a number of separate kingdoms since the fifteenth century (Duncan 1990; Jazeel 2009). The replacement of this multi-cultural space with a unitary British imperial island colony was, according to one researcher, reflected in a sense of modernity in the everyday material cultures of local people, while the damaging legacy of the unification can be clearly seen in the destructive civil war that plagued the country from 1983 to 2009 (Wickramasinghe 2009). Such issues are pertinent to understanding the complex interactions that Clarke had with the places and landscapes of Ceylon/Sri Lanka, particularly the understandings of modernity and progress that were central to Clarke’s world-view.

Discourses of space exploration have, in the ways outlined here, been connected to a variety of familiar geographical imaginations concerning empire, adventure and the anticipation of a technologically-driven future. Yet studying Arthur C. Clarke adds the further perspective of experiencing and representing tropical spaces as part of a critical geopolitics of outer space, an exercise that has only received partial critical attention through Redfield’s work on French Guiana. By turning to three phases in Clarke’s life and works we can see how cultures of empire, technological determinism and ‘cosmological tropicality’ are played out in the immediate context of late-twentiethcentury Ceylon/Sri Lanka.

#### That ethical frame outweighs.

Klinger, 19—Frederick S. Pardee School of Global Studies, Boston University (Julie Michelle, “Environmental Geopolitics and Outer Space,” Geopolitics, March 20, 2019, dml)

On Earth, the environmental geopolitics of outer space are inseparable from questions of environmental justice. Environmental (in)justice unfolds across multiple scales through concrete processes: localized and stratospheric emissions from space launches (Carlsen, Kenesova, and Batyrbekova 2007; Jones, Bekki, and Pyle 1995), the placement of outer space related infrastructure in national and global peripheries (Gorman 2007; Mitchell 2017; Redfield 2001), and the use of such infrastructure to advance or thwart environmental destruction (Da Costa 2001; Guzmán 2013; Parks 2012).

Human engagement with outer space enlists industrial economies, global networks of infrastructure and expertise, and the generation and control of information. All of these activities take place in specific sites and are subject to ongoing transformations in territorial governance practices. By locating infrastructures that are securitized, dangerous, and environmentally toxic in remote areas, the state or empire accomplishes two things. It consolidates power in far-flung territories while mitigating against liabilities and security threats that might arise from placing launch infrastructures closer to the metropole. In order to reduce environmental impacts, adequate resources, personnel, and expertise need to be assigned to the task of monitoring and mitigating the regional fallout of rocket launches (Hall et al. 2014). This may not be the case if the site in question has been deemed sacrificable by those with territorial control.

Launches and Their Infrastructures

Reaching outer space requires Earthly infrastructure, which means that space launches have concrete footprints that change according to developments in launch technologies. The placement of outer space related infrastructure on Earth is a question of environmental (in)justice. Which sites are chosen, who is expropriated, and which environments are impacted is subject to strategic geopolitical calculations, which, more often than not, employ classical geopolitical reasoning (Hickman and Dolman 2002; Ingold 2006; Meira Filho, Guimarães Fortes, and Barcelos 2014; NDRI 2006). Launch sites are tightly controlled to reduce the risk of interference or failure, therefore situating launch sites in remote areas is often explained in terms of safety and security (Zapata and Murray 2008). No doubt this is important: rockets are composed of many tonnes of material and combustive fuel, so they must be launched in places where damage from routine as well as potentially catastrophic explosions can be contained. For humans to reach “the final frontier,” they must first find a frontier space on Earth that can be made into an empty space in which controlled explosions can be routine.

Frontiers are seldom as empty as those aiming to conquer them would claim. Where they are not populated by people, they are filled with other sorts of meanings and life forms (Klinger 2017; Tsing 2005). Potential launch sites and testing ranges deemed by government authorities to be simultaneously remote, safe, and suitable to contain the risks of rocket launch must first be made empty of people, with prior land use regimes or territorial claims pushed beyond designated buffer zones (Gorman 2007; Mitchell 2017). Hence the placement of space infrastructure follows colonial geographies of extraction, sacrifice, and risk (Mitchell 2017; Redfield 2001). As Gorman (2007) put it: “because of their distance from the metropole, these places lend themselves to hosting prisons, detention camps, military installations, nuclear weapons, and nuclear waste. All of these establishments, including rocket ranges, have inspired reactions of protest.” These so-called ‘peripheral’ spaces are nevertheless central to their inhabitants and their neighbors, who question the logic of extraglobal conquest in the face of unresolved Earthly injustices.

Consider, for example, the case of the launch site in Alcântara, Brazil, which has been well documented by Araújo and Filho (2006) and Mitchell (2017). Through a close examination of local, national, and international politics, these authors document how the government’s racialized approach to the subsistence communities displaced by space infrastructure deepened structural inequalities. Grassroots opposition to the launch site grew not out of an a priori ideological opposition of poor people to national progress in outer space, as some officials alleged, but rather resulted from the failure to account for the food insecurity generated by state resettlement projects. The resettlement schemes were themselves misinformed by impoverished notions of local livelihoods. Local claims against the deprivations caused by statesponsored space practices have deepened schisms between the military and civilian space programs at the federal government level.

Through the lens of classical geopolitics, these structural inequalities scarcely register, with the result that the ‘crawling’ progress of Brazil’s space program is pathologized as poor management practices symptomatic of an inadequately implemented national development vision (Amaral 2010). Critical geopolitics helps deconstruct the nationalist performativity of such endeavors by considering the political and economic value placed on the spectacle of spaceflight (Boczkowska 2017; Macdonald 2008, 2010; Sage 2016). Feminist geopolitics draws our attention to the racialized and gendered dispossession advanced by the state, through the construction of space infrastructure and exercised through access to land. The fact that environmental and public health impacts were only considered by the authorities after years of mobilization by Black social movements, religious communities, and scholars highlights the ways in which inattention to the local in the pursuit of space power perpetuates environmental injustice, which in turn interrupts national plans for space progress.

Rocket launches affect local and global environments through the construction of infrastructure, the exposure of local environments to toxic residues, and the dispersal of pollutants in land, air, and sea. Rockets are the only source of direct anthropogenic emissions sources in the stratosphere. Ozone-depleting substances (ODS) such as nitrous oxide, hydrogen chlorine, and aluminum oxide are emitted by rockets, and can destroy 105 ozone molecules before degrading (Voigt et al. 2013). The ozone layer prevents cancer and cataract-causing ultraviolet-b waves from reaching the Earth. As of 2013, rocket launches accounted for less than 1% of ODS emissions. As other ODS are phased out under the Montreal Protocol and the frequency of lower cost space launches increases, the proportion and quantity is likely to increase (Durrieu and Nelson 2013; Ross et al. 2009).

Although affluent economies in the northern hemisphere are responsible for most ODS emissions (Polvani 2011; Rousseaux et al. 1999), the geography of exposure disproportionately affects an overall higher population in remote regions and in the southern hemisphere (Norval et al. 2011; Robinson and Erickson 2015; Thompson et al. 2011) because ozone depletion is most serious in regions where high altitude stratospheric clouds are most likely to form: above the polar regions and major mountain ranges (Carslaw et al. 1998; Perlwitz et al. 2008). This is an example of environmental injustice on a global scale, where the global south bears the environmental burden of actions predominately taken in the global north, rocket launches included. In the process, global power relations are reinscribed through the uneven distribution of harm to peripheral and southern bodies, mediated in this case through the redistribution of gases in the stratosphere that increase exposure to solar radiation.

Coming closer to Earth, environmental geopolitics of outer space are manifest in the dispersal of particulate matter into ecosystems surrounding active launch sites. This is more than a strictly local environmental concern, because which spaces are subject to the hazards of launch sites involves careful calculations weighing financial cost, state power, and multifarious territorial interests. With each launch, surrounding areas are showered with toxins, heavy metals, and acids over a distance that varies widely with wind, weather, and precipitation patterns at the moment of lift-off.3 The most researched of these pollutants are hydrogen chloride, aluminum oxide, and various aerosolized heavy metals. Release of these pollutants from rocket launches results in localized regional acid rain (Madsen 1981), plant death, fish kills, and failed seed germination of native plants in launch sites (Marion, Black, and Zedler 1989; Schmalzer et al. 1992).

These effects, and research on them, are mostly concentrated within one kilometer of the launch site. But they have been recorded several kilometers away under certain weather conditions (Schmalzer et al. 1998). Recent studies on the concentration of trace elements in wildlife in areas near NASA launch activities in Florida, USA, found that more than half of the adults and juvenile alligators had “greater than toxic levels” of trace elements in their liver (Horai et al. 2014). Both the subject, and the vague statement of findings, highlights the lack of research into the impacts on downstream human and non-human communities. In contrast to the precautions taken to protect workers in buildings adjacent to facilities where these technologies are developed (Bolch et al. 1990; Chrostowski, Gan, and Campbell 2010), much less consideration is given to communities within the dynamic pollutant shadow of rocket launches.

In Kazakhstan, Russia, and China, researchers have begun examining the effects of the highly toxic liquid propellant, unsymmetrical dimethylhydrazine (UDMH), which has been in use since the dawn of the space age. It has noted carcinogenic, mutagenic, convulsant, teratogenic, and embryotoxic effects (Carlsen, Kenesova, and Batyrbekova 2007), and it has been found to cause DNA damage and chromosomal aberrations in rodents living near the Baikonur cosmodrome in Kazakhstan (Kolumbayeva et al. 2014). Despite these known hazards, methods to detect UDMH at the trace concentrations at which toxic effects begin to manifest in humans do not yet exist (Kenessov, Bakaikina, and Ormanbekovna 2015), meaning that there is no knowledge of how this circulates in the environment, bioaccumulates up the food chain, or could potentially be sequestered through soil or plant filtration. The lack of technology or methodology to adequately track the dispersal of hazardous pollutants that have been used for decades in the surrounding environment illustrates another aspect of environmental injustice: the preference on the part of political and economic elites to create spaces of waste rather than allocate adequate resources to maintain safe and non-toxic environments.4

Not specifying an agent is a voting issue – especially on non-US actors where the legislative process has multiple possiblities– wrecks counterplan competition, disad links and skews neg fairness by letting the 1ar shift in the future.

### 1NC – CP – EIA

**The People’s Republic of China should submit an environmental impact assessment of the appropriation of outer space by private entities to the UN Office of Outer Space Affairs for public comment, modification, and approval. The United States federal government should implement the approved version of the submitted proposal.**

#### Normal means is NPC & LAC unilateral action in Chinese “Congress” – cx proves unilateral action w/o consultation

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

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

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

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

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

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

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

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

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

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

### 1NC – K – Techno-Orientalism

#### Their descriptions of China rising merely serve to *repeat* racialized tropes of yellow peril through *techno-orientalism* framing Asians as subhuman, whose success, location or population pose a threat to the western liberal order

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Yellow Peril and Techno-Orientalism

The term yellow peril emerged in the late nineteenth century in response to Japan’s arrival to the geopolitical stage as a formidable military and industrial contender to the Western powers of Europe and the United States.9 The concept was further elaborated and given a tangible racial form through Sax Rohmer’s series of novels and films that provided the early content for the social imaginary of “yellow peril” along with its personification in the character of Dr. Fu Manchu, the iconic supervillain archetype of the Asian “evil criminal genius,” and his cast of minions.10 Strikingly, Dr. Fu Manchu’s characterization as evil, criminal, and genius continues to inform the racial trope of the Asian scientist spy; and more recently, we may add to the list the bioengineer, the CFO, the international graduate student, to name just a few. Moreover, the notion of the non-differentiable “yellow” masses continues to function as a homogenizing and dehumanizing device of Asian racialization, which makes possible the transference of Sinophobia to Asian xenophobia.

In its inherent attempt to construct a racial other, “yellow peril” is more a projection of Western fear than a representation of an Asian object/subject, and in this sense, it may be better understood as a repository of racial affect that can animate a myriad of representational figures, images, and discourses, depending on context. Indeed, the images and discourses of yellow peril have surfaced multiple times throughout the twentieth century, capturing a multitude of ever-shifting perceived threats that range from the danger of military intrusion (i.e., Japanese Americans during WWII), economic competition (i.e., Chinese laborers in the late nineteenth century, Japan in the 1980s), Asian moral and cultural depravity (i.e., non-Christian heathens, Chinese prostitutes, opium smokers), to biological inferiority (i.e., effeminacy, disease carriers). As Colleen Lye observes, “the incipient ‘yellow peril’ refers to a particular combinatory kind of anticolonial [and anti-West] nationalism, in which the union of Japanese technological advance and Chinese numerical mass confronts Western civilization with a potentially unbeatable force.”11 Arguably, the yellow peril of today represents heightened Western anxieties around China’s combined forces of population size, global economic growth, and rapid technological-scientific innovation—all of which emerge from a political system that is considered ideologically oppositional to ours. The current context, we suggest, is best understood through the lens of techno-Orientalism.

When the idea of techno-Orientalism first appeared in David Morley and Kevin Robins’s analysis of why Japan occupied such a threatening position in Western imagination in the late 1980s, techno-Orientalism offered a framework to make sense of the technologically imbued racist stereotypes of Japan/the Japanese that were emerging within the context of Western fears and anxieties around Japan’s ascendancy as a technological global power. They proposed that if technological advancement has been crucial to Western civilizational progress, then Japan’s technological superiority over the West also signals a critical challenge to Western hegemony, including its cultural authority to control representations of the West and its “others.” They claimed that the shifting balance in global power—the West’s loss of technological preeminence—has induced an identity crisis in the West. In response, techno-Orientalism, in which “[idioms of technology] become structured into the discourse of Orientalism,” is produced in large part to discipline Japan and its rise to techno-economic power.12 The United States, for instance, externalized its anxiety into xenophobic projections of Japan as a “culture that is cold, impersonal, and machine-like” in which its people are **“sub-human”** and **“unfeeling aliens.”**13 Techno-Orientalism, born from the “Japan Panic,” was effectively consolidated through and around political-economic concerns that frame Japanese and, by extension, Asian techno-capitalist progress as **dangerous and dystopian.**

Extending Edward Said’s concept of Orientalism,14 techno-Orientalism marks a geo-historical shift where the West no longer has control over the terms that define the East—the “Orient”—as weak, inferior, and subordinate to the West. It marks a shift not only in political-economic power but also in cultural authority. Techno-Orientalism, then, is the expressive vehicle (cultural productions and visual representations) by which Western and Eastern nations articulate their fears, desires, and anxieties that are produced in their competitive struggle to gain technological hegemony through economic trade and scientific innovation.15

Analogous to Japan’s position in the late 1980s, China currently figures into the techno-Orientalist imaginary as a powerful competitor in mass production, a global financial giant, and an aggressive investor in technological, infrastructural, and scientific developments. At the same time, the increasing purchasing power of China provokes American fear of a future global market that is economically driven by Chinese consumptive desires and practices. It is this duality—the domination of both production and consumption across different sectors of the techno-capitalist global economy—that undergirds American anxieties of a sinicized future.16

Further amplifying these anxieties around Chinese techno-economic domination is our imagination of China/the Chinese as the ultimate yellow peril, whose state ideology is oppositional to that of the United States and whose unmatched population size combined with its economic expansion and technological advancements may actually pose a real challenge to U.S. global hegemony. We turn now to examine how the ideology of yellow peril is manifesting in the current context of techno-Orientalism, beginning first with an analysis of the racial trope of “Chinese as contagion” and its connection to anti-Asian aggression.

**The alternative is to reject the AFF in favor of an epistemic rejection of Area Studies that define knowledge production through mapping the external world as unstable, hostile and target. Only de-centering knowledge production from the self can solve inevitable conflict and orientalist violence**

**Chow 6** (Rey, Anne Firor Scott Professor of Literature at Duke University, April 2006, “Age of the World as Target”, Rey Chow Reader) APS recut aaditg

Among the most important elements in war, writes karl von Clausewitz, are the “moral elements.”32 From the United States’ point of view, this phrase does not seem at all ironic. Just as the bombings of Afghanistan and Iraq in the first few years of the twenty-first century were justified as benevolent acts to preserve the united States and the rest of the world against “the axis of evil,” “weapons of mass destruction,” and the like, so were the bombings of Hiroshima and Nagasaki considered pacific acts, acts that were meant to save lives and save civilization in a world threatened by German Nazism. (Though, by the time the bombs were dropped in Japan, Germany had already surrendered.) even today, some of the most educated, scientifically knowledgeable members of U.S. society continue to believe that the atomic bomb was the best way to terminate the hostilities.33 And, while the media in the united States are quick to join the media elsewhere in reporting the controversies over Japan’s refusal to apologize for its war crimes in Asia or over France’s belatedness in apologizing for the Vichy government’s persecution of the Jews, no U.S. head of state has ever visited Hiroshima or Nagasaki, or expressed regret for the nuclear holocaust.34 In this—its absolute conviction of its own moral superiority and legitimacy—lies perhaps the most deeply ingrained connection between the foundation myth of the United States as an exceptional nation and the dropping of the atomic bombs (as well as all the military and economic interventions the united States has made in nationalist struggles in Asia, Latin America, and the Middle east since the Second World War).35 even on occasions such as Pearl Harbor (December 7, 1941) and September 11, 2001, when the united States had to recognize that it was just part of the world (and hence could be attacked like any other country), its response was typically that of reasserting U.S. exceptionalism—This cannot happen to us! We are unique, we cannot be attacked!—by ferociously attacking others. In the decades since 1945, whether in dealing with the Soviet union, the People’s republic of China, north korea, vietnam, and countries in Central America, or during the gulf Wars, the united States has been conducting war on the basis of a certain kind of knowledge production, and producing knowledge on the basis of war. **War and knowledge** enable and **foster each other** primarily through the collective fantasizing of some foreign or alien body that poses danger to the “self” and the “eye” that is the nation. once the monstrosity of this foreign body is firmly established in the national consciousness, the decision makers of the u.S. government often talk and behave as though they had no choice but war. **War**, then, **is acted out as a moral obligation to expel an imagined** dangerous **alienness** from the united States’ self-concept as the global custodian of freedom and democracy. Put in a different way, **the “moral element,”** insofar as it produces knowledge about the “self” and “other”—and hence the “eye” and its “target”—as such, **justifies war by its very dichotomizing logic**. Conversely, **the violence of war**, once begun, **fixes the other in its attributed monstrosity and affirms the idealized image of the self.** In this regard, the pernicious stereotyping of the Japanese during the Second World War—not only by u.S. military personnel but also by social and behavioral scientists—was simply a flagrant example of an ongoing ideological mechanism that had accompanied Western treatments of non-Western “others” for centuries. In the hands of academics such as geoffrey gorer, writes Dower, the notion that was collectively and “objectively” formed about the Japanese was that they were “a clinically compulsive and probably collectively neurotic people, whose lives were governed by ritual and ‘situational ethics,’ wracked with insecurity, and swollen with deep, dark currents of repressed resentment and aggression.”37 As Dower points out, such stereotyping was by no means accidental or unprecedented: The Japanese, so “unique” in the rhetoric of World War Two, were actually saddled with racial stereotypes that europeans and Americans had applied to nonwhites for centuries: during the conquest of the new World, the slave trade, the Indian wars in the united States, the agitation against Chinese immigrants in America, the colonization of Asia and Africa, the U.S. conquest of the Philippines at the turn of the century. These were stereotypes, moreover, which had been strongly reinforced by nineteenthcentury Western science. In the final analysis, in fact, these favored idioms denoting superiority and inferiority transcended race and represented formulaic expressions of Self and Other in general.38 The moralistic divide between “self” and “other” constitutes the production of knowledge during the U.S. occupation of Japan after the Second World War as well. As Monica Braw writes, in the years immediately after 1945, the risk that the united States would be regarded as barbaric and inhumane was carefully monitored, in the main by cutting off Japan from the rest of the world through the ban on travel, control of private mail, and censorship of research, mass media information, and other kinds of communication. The entire occupation policy was permeated by the view that “the united States was not to be accused; guilt was only for Japan”:39 As the occupation of Japan started, the atmosphere was military. Japan was a defeated enemy that must be subdued. The Japanese should be taught their place in the world: as a defeated nation, Japan had no status and was entitled to no respect. People should be made to realize that any catastrophe that had befallen them was of their own making. until they had repented, they were suspect. If they wanted to release information about the atomic bombings of Hiroshima and nagasaki, it could only be for the wrong reasons, such as accusing the united States of inhumanity. Thus this information was suppressed.40 As in the scenario of aerial bombing, the elitist and aggressive panoramic “vision” in which the other is beheld means that **the sufferings of the other matters much less than the transcendent aspirations of the self**. And, despite being the products of a particular culture’s technological fanaticism, such transcendent aspirations are typically expressed in the form of selfless universalisms. As Sherry puts it, “The reality of Hiroshima and nagasaki seemed less important than the bomb’s effect on ‘[hu]mankind’s destiny,’ on ‘humanity’s choice,’ on ‘what is happening to men’s minds,’ and on hopes (now often extravagantly revived) to achieve world government.” On Japan’s side, as yoneyama writes, such a “global narrative of the universal history of humanity” has helped sustain **“a national victimology and phantasm of innocence throughout most of the postwar years**.” going one step further, she remarks: “The idea that Hiroshima’s disaster ought to be remembered from the transcendent and anonymous position of humanity . . . might best be described as ‘nuclear universalism.’ once the relations among war, racism, and knowledge production are underlined in these terms, it is no longer possible to assume, as some still do, **that the recognizable features of modern war**—its impersonality, coerciveness, and deliberate cruelty—are “divergences” from the “antipathy” to violence and to conflict that characterize the modern world.43 Instead, it would be incumbent on us to realize that the pursuit of war—with its use of violence—and the pursuit of peace—with its cultivation of knowledge—are the obverse and reverse of the same coin, the coin that I have been calling “the age of the world target.” rather than being irreconcilable opposites, **war and peace are coexisting, collaborative functions in the continuum of a virtualized world**. More crucially still, only the privileged nations of the world can afford to wage war and preach peace at one and the same time. As Sherry writes, “The united States had different resources with which to be fanatical: resources allowing it to take the lives of others more than its own, ones whose accompanying rhetoric of technique disguised the will to destroy.”44 From this it follows that, if indeed political and military acts of cruelty are not unique to the united States—a point which is easy enough to substantiate—what is nonetheless remarkable is the manner in which such acts are, in the united States, usually cloaked in the form of enlightenment and altruism, in the form of an aspiration simultaneously toward technological perfection and the pursuit of peace. In a country in which political leaders are held accountable for their decisions by an electorate, violence simply cannot—as it can in totalitarian countries—exist in the raw. even the most violent acts must be adorned with a benign, rational story. It is in the light of such interlocking relations among war, racism, and knowledge production that I would make the following comments about area studies, the academic establishment that crystallizes the connection between the epistemic targeting of the world and the ‘‘humane’’ practices of peacetime learning. From Atomic Bombs to Area Studies As its name suggests, area studies as a mode of knowledge production is, strictly speaking, military in its origins. Even though the study of the history, languages, and literatures of, for instance, ‘‘Far Eastern’’ cultures existed well before the Second World War (in what Edward W. Said would term the old Orientalist tradition predicated on philology), the systematization of such study under the rubric of special geopolitical areas was largely a postwar and U.S. phenomenon. In H. D. Harootunian’s words, ‘‘The systematic formation of area studies, principally in major universities, was . . . a massive attempt to relocate the enemy in the new configuration of the Cold War.’ As Bruce Cumings puts it: It is now fair to say, based on the declassified evidence, that the American state and especially the intelligence elements in it shaped the entire field of postwar area studies, with the clearest and most direct impact on those regions of the world where communism was strongest: Russia, Central and Eastern Europe, and East Asia.’ In the decades after 1945, when the United States competed with the Soviet Union for the power to rule and/or destroy the world, these regions were the ones that required continued, specialized super-vision; to this list we may also add Southeast Asia, Latin America, and the Middle East. As areas to be studied, these regions took on the significance of **target fields—** **fields of information retrieval and dissemination** that **were necessary for the perpetuation of the United States’ political and ideological hegemony**. In the final part of his classic Orientalism, Said describes area studies as a continuation of the old European Orientalism with a different pedagogical emphasis: No longer does an Orientalist try first to master the esoteric languages of the Orient; he begins instead as a trained social scientist and ‘applies’ his science to the Orient, or anywhere else. This is the specifically American contribution to the history of Orientalism, and it can be dated roughly from the period immediately following World War II, when the United States found itself in the position recently vacated by Britain and France. Whereas Said draws his examples mainly from Islamic and Middle Eastern area studies, Cumings provides this portrait of the East Asian target field: The Association for Asian Studies (AAS) was the first ‘‘area’’ organization in the U.S., founded in 1943 as the Far Eastern Association and reorganized as the AAS in 1956. Before 1945 there had been little attention to and not much funding for such things; but now the idea was to bring coe ntemporary social science theory to bear on the non-Western world, rather than continue to pursue the classic themes of Oriental studies, often examined through philology. . . . In return for their severance, the Orientalists would get vastly enhanced academic resources (positions, libraries, language studies)—and soon, a certain degree of separation which came from the social scientists inhabiting institutes of East Asian studies, whereas the Orientalists occupied departments of East Asian languages and cultures. This implicit Faustian bargain sealed the postwar academic deal. A largely administrative enterprise, closely tied to policy, the new American Orientalism took over from the old Orientalism attitudes of cultural hostility, among which is, as Said writes, the dogma that ‘the Orient is at bottom something either to be feared (the Yellow Peril, the Mongol hordes, the brown dominions) or to be controlled (by pacification, research and development, outright occupation whenever possible).’Often under the modest and apparently innocuous agendas of fact gathering and documentation, the ‘‘scientific’’ and ‘‘objective’’ **production of knowledge during peacetime** about the various special ‘‘areas’’ **became the institutional practice that substantiated and elaborated the militaristic conception of the world as target**. In other words, despite the claims about the apolitical and disinterested nature of the pursuits of higher learning, activities undertaken under the rubric of area studies, such as language training, historiography, anthropology, economics, political science, and so forth, are fully inscribed in the politics and ideology of war. To that extent, the disciplining, research, and development of so-called academic information are part and parcel of a strategic logic. And yet, if the production of knowledge (with its vocabulary of aims and goals, research, data analysis, experimentation, and verification) in fact shares the same scientific and military premises as war— if, for instance, the ability to translate a diffcult language can be regarded as equivalent to the ability to break military codes —is it a surprise that it is doomed to fail in its avowed attempts to ‘‘know’’ the other cultures? **Can ‘‘knowledge’’ that is derived from the same kinds of bases as war put an end to the violence of warfare**, or is such knowledge not simply warfare’s accomplice, destined to destroy rather than preserve the forms of lives at which it aims its focus? As long as knowledge is produced in this self-referential manner, as a circuit of targeting or getting the other that ultimately consolidates the omnipotence and omnipresence of the sovereign ‘‘self ’’/‘‘eye’’—the ‘‘I’’—that is the United States, the other will have no choice but remain just that— a target whose existence justifies only one thing, its destruction by the bomber. As long as the focus of our study of Asia remains the United States, and as long as this focus is not accompanied by knowledge of what is happening elsewhere at other times as well as at the present, such study will ultimately confirm once again the self-referential function of virtual worlding that was unleashed by the dropping of the atomic bombs, with the United States always occupying the position of the bomber, and other cultures always viewed as the military and information target fields. In this manner, events whose historicity does not fall into the epistemically closed orbit of the atomic bomber— such as the Chinese reactions to the war from a primarily anti-Japanese point of view that I alluded to at the beginning of this chapter— will never receive the attention that is due to them. ‘‘Knowledge,’’ however conscientiously gathered and however large in volume, will lead only to further silence and to the silencing of diverse experiences. This is one reason why, as Harootunian remarks, area studies has been, since its inception, haunted by ‘‘the absence of a definable object’’—and by ‘‘the problem of the vanishing object.’’

### 1NC – Case – Framework

#### Presumption, permissibility, and skep negate –

**[1] Obligations- the resolution indicates the affirmative has to prove an obligation, and permissibility would deny the existence of an obligation**

**[2] Falsity- Statements are more often false than true because proving one part of the statement false disproves the entire statement. Presuming all statements are true creates contradictions which would be ethically bankrupt.**

**[3] Negating is harder – Aff gets last speech to crystallize and shape the debate in a way the favors them with no 3NR**

Util –

1] Problem of induction—I predict based on past experiences, but there’s no justification for why those past experiences are true besides they worked in the past, which is based on experiences and is circular

2] Infinite consequences—each action has a consequence which leads to another consequence—if I drop a pen, that could lead to a hurricane so there is no consequence that can be predicted

3] Util triggers skep—if our bodies naturally know pain is bad and pleasure is good, we automatically act off pain and pleasure ie I automatically remove my hand from a hot stove bc receptors unconsciously trigger my hand to move—means we don’t have control over action and there can’t be moral prescription

4] Infinite regress—calculating consequences begs the question of how long I should calculate to have a precise prediction. Triggers infinite regress since I can think how long to calculate calculation and so forth—freezes action

### 1NC – Case – Turn

#### Extinction is inevitable from future technology — nanotech, biotech, particle accelerators, and black swans

Bruce **Sterling**, 6-1-20**18**, "When Nick Bostrom says “Bang”," WIRED, https://www.wired.com/beyond-the-beyond/2018/06/nick-bostrom-says-bang/

4.1 Deliberate misuse of nanotechnology

In a mature form, molecular nanotechnology will enable the construction of bacterium-scale self-replicating mechanical robots that can feed on dirt or other organic matter [22-25]. Such replicators could eat up the biosphere or destroy it by other means such as by poisoning it, burning it, or blocking out sunlight. A person of malicious intent in possession of this technology might cause the extinction of intelligent life on Earth by releasing such nanobots into the environment.[9]

The technology to produce a destructive nanobot seems considerably easier to develop than the technology to create an effective defense against such an attack (a global nanotech immune system, an “active shield” [23]). It is therefore likely that there will be a period of vulnerability during which this technology must be prevented from coming into the wrong hands. Yet the technology could prove hard to regulate, since it doesn’t require rare radioactive isotopes or large, easily identifiable manufacturing plants, as does production of nuclear weapons [23].

Even if effective defenses against a limited nanotech attack are developed before dangerous replicators are designed and acquired by suicidal regimes or terrorists, there will still be the danger of an arms race between states possessing nanotechnology. It has been argued [26] that molecular manufacturing would lead to both arms race instability and crisis instability, to a higher degree than was the case with nuclear weapons. Arms race instability means that there would be dominant incentives for each competitor to escalate its armaments, leading to a runaway arms race. Crisis instability means that there would be dominant incentives for striking first. Two roughly balanced rivals acquiring nanotechnology would, on this view, begin a massive buildup of armaments and weapons development programs that would continue until a crisis occurs and war breaks out, potentially causing global terminal destruction

of a nuclear war, it could lead to the collapse of civilization. A human race living under stone-age conditions may or may not be more resilient to extinction than other animal species.

4.3 We’re living in a simulation and it gets shut down

A case can be made that the hypothesis that we are living in a computer simulation should be given a significant probability [27]. The basic idea behind this so-called “Simulation argument” is that vast amounts of computing power may become available in the future (see e.g. [28,29]), and that it could be used, among other things, to run large numbers of fine-grained simulations of past human civilizations. Under some not-too-implausible assumptions, the result can be that almost all minds like ours are simulated minds, and that we should therefore assign a significant probability to being such computer-emulated minds rather than the (subjectively indistinguishable) minds of originally evolved creatures. And if we are, we suffer the risk that the simulation may be shut down at any time. A decision to terminate our simulation may be prompted by our actions or by exogenous factors.

While to some it may seem frivolous to list such a radical or “philosophical” hypothesis next the concrete threat of nuclear holocaust, we must seek to base these evaluations on reasons rather than untutored intuition. Until a refutation appears of the argument presented in [27], it would intellectually dishonest to neglect to mention simulation-shutdown as a potential extinction mode.

4.4 Badly programmed superintelligence

When we create the first superintelligent entity [28-34], we might make a mistake and give it goals that lead it to annihilate humankind, assuming its enormous intellectual advantage gives it the power to do so. For example, we could mistakenly elevate a subgoal to the status of a supergoal. We tell it to solve a mathematical problem, and it complies by turning all the matter in the solar system into a giant calculating device, in the process killing the person who asked the question. (For further analysis of this, see [35].)

4.5 Genetically engineered biological agent

With the fabulous advances in genetic technology currently taking place, it may become possible for a tyrant, terrorist, or ~~lunatic~~ to create a doomsday virus, an organism that combines long latency with high virulence and mortality [36].

Dangerous viruses can even be spawned unintentionally, as Australian researchers recently demonstrated when they created a modified mousepox virus with 100% mortality while trying to design a contraceptive virus for mice for use in pest control [37]. While this particular virus doesn’t affect humans, it is suspected that an analogous alteration would increase the mortality of the human smallpox virus. What underscores the future hazard here is that the research was quickly published in the open scientific literature [38]. It is hard to see how information generated in open biotech research programs could be contained no matter how grave the potential danger that it poses; and the same holds for research in nanotechnology.

Genetic medicine will also lead to better cures and vaccines, but there is no guarantee that defense will always keep pace with offense. (Even the accidentally created mousepox virus had a 50% mortality rate on vaccinated mice.) Eventually, worry about biological weapons may be put to rest through the development of nanomedicine, but while nanotechnology has enormous long-term potential for medicine [39] it carries its own hazards.

4.6 Accidental misuse of nanotechnology (“gray goo”)

The possibility of accidents can never be completely ruled out. However, there are many ways of making sure, through responsible engineering practices, that species-destroying accidents do not occur. One could avoid using self-replication; one could make nanobots dependent on some rare feedstock chemical that doesn’t exist in the wild; one could confine them to sealed environments; one could design them in such a way that any mutation was overwhelmingly likely to cause a nanobot to completely cease to function [40]. Accidental misuse is therefore a smaller concern than malicious misuse [23,25,41].

However, the distinction between the accidental and the deliberate can become blurred. While “in principle” it seems possible to make terminal nanotechnological accidents extremely improbable, the actual circumstances may not permit this ideal level of security to be realized. Compare nanotechnology with nuclear technology. From an engineering perspective, it is of course perfectly possible to use nuclear technology only for peaceful purposes such as nuclear reactors, which have a zero chance of destroying the whole planet. Yet in practice it may be very hard to avoid nuclear technology also being used to build nuclear weapons, leading to an arms race. With large nuclear arsenals on hair-trigger alert, there is inevitably a significant risk of accidental war. The same can happen with nanotechnology: it may be pressed into serving military objectives in a way that carries unavoidable risks of serious accidents.

In some situations it can even be strategically advantageous to deliberately make one’s technology or control systems risky, for example in order to make a “threat that leaves something to chance” [42].

4.7 Something unforeseen

We need a catch-all category. It would be foolish to be confident that we have already imagined and anticipated all significant risks. Future technological or scientific developments may very well reveal novel ways of destroying the world.

Some foreseen hazards (hence not members of the current category) which have been excluded from the list of bangs on grounds that they seem too unlikely to cause a global terminal disaster are: solar flares, supernovae, black hole explosions or mergers, gamma-ray bursts, galactic center outbursts, supervolcanos, loss of biodiversity, buildup of air pollution, gradual loss of human fertility, and various religious doomsday scenarios. The hypothesis that we will one day become “illuminated” and commit collective suicide or stop reproducing, as supporters of VHEMT (The Voluntary Human Extinction Movement) hope [43], appears unlikely. If it really were better not to exist (as Silenus told king Midas in the Greek myth, and as Arthur Schopenhauer argued [44] although for reasons specific to his philosophical system he didn’t advocate suicide), then we should not count this scenario as an existential disaster. The assumption that it is not worse to be alive should be regarded as an implicit assumption in the definition of Bangs. Erroneous collective suicide is an existential risk albeit one whose probability seems extremely slight. (For more on the ethics of human extinction, see chapter 4 of [9].)

4.8 Physics disasters

The Manhattan Project bomb-builders’ concern about an A-bomb-derived atmospheric conflagration has contemporary analogues.

There have been speculations that future high-energy particle accelerator experiments may cause a breakdown of a metastable vacuum state that our part of the cosmos might be in, converting it into a “true” vacuum of lower energy density [45]. This would result in an expanding bubble of total destruction that would sweep through the galaxy and beyond at the speed of light, tearing all matter apart as it proceeds.

Another conceivability is that accelerator experiments might produce negatively charged stable “strangelets” (a hypothetical form of nuclear matter) or create a mini black hole that would sink to the center of the Earth and start accreting the rest of the planet [46].

These outcomes seem to be impossible given our best current physical theories. But the reason we do the experiments is precisely that we don’t really know what will happen. A more reassuring argument is that the energy densities attained in present day accelerators are far lower than those that occur naturally in collisions between cosmic rays [46,47]. It’s possible, however, that factors other than energy density are relevant for these hypothetical processes, and that those factors will be brought together in novel ways in future experiments.

The main reason for concern in the “physics disasters” category is the meta-level observation that discoveries of all sorts of weird physical phenomena are made all the time, so even if right now all the particular physics disasters we have conceived of were absurdly improbable or impossible, there could be other more realistic failure-modes waiting to be uncovered. The ones listed here are merely illustrations of the general case.

#### War is inevitable---BUT, the longer we wait, the worse it gets.

Seth **Baum &** Anthony **Barrett 18**. Global Catastrophic Risk Institute. 2018. “A Model for the Impacts of Nuclear War.” SSRN Electronic Journal. Crossref, doi:10.2139/ssrn.3155983.

On the other end of the spectrum, the norm could be weaker. The Hiroshima and Nagasaki bombings provided a vivid and enduring image of the horrors of nuclear war—hence the norm can reasonably be described as a legacy of the bombings. Without this image, there would be less to motivate the norm. A weaker norm could in turn have led to a nuclear war occurring later, especially during a near-miss event like the Cuban missile crisis. A later nuclear war would likely be much more severe, assuming some significant buildup of nuclear arsenals and especially if “overkill” targeting was used. A new nuclear war could bring a similarly wide range of shifts in nuclear weapons norms. It could strengthen the norm, hastening nuclear disarmament. Already, there is a political initiative drawing attention to the humanitarian consequences of nuclear weapons use in order to promote a new treaty to ban nuclear weapons as a step towards complete nuclear disarmament (Borrie 2014). It is easy to imagine this initiative using any new nuclear attacks to advance their goals. Alternatively, it could weaken the norm, potentially leading to more and/or larger nuclear wars. This is a common concern, as seen for example in debates over low-yield bunker buster nuclear weapons (Nelson 2003). Given that the impacts of a large nuclear war could be extremely severe, a shift in nuclear weapons norms could easily be the single most consequential effect of a smaller nuclear war.

#### Nuke war won’t cause extinction---BUT, it’ll spur political will for meaningful disarmament.

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Although nuclear war is the oldest of these technogenic threats to civilization and human survival, and although important steps to restraint, particularly at the end of the Cold War, have been achieved, the nuclear world is increasingly changing in major ways, and in almost entirely dangerous directions. The third “bombs away” phase of the great debate on the nuclear-political question is more consequentially divided than in the first two phases. Even more ominously, most of the momentum lies with the forces that are pulling states toward nuclear-use, and with the radical actors bent on inflicting catastrophic damage on the leading states in the international system, particularly the United States. In contrast, the arms control project, although intellectually vibrant, is largely in retreat on the world political stage. The arms control settlement of the Cold War is unraveling, and the world public is more divided and distracted than ever. With the recent election of President Donald Trump, the United States, which has played such a dominant role in nuclear politics since its scientists invented these fiendish engines, now has an impulsive and uninformed leader, boding ill for nuclear restraint and effective crisis management. Given current trends, it is prudent to assume that sooner or later, and probably sooner, nuclear weapons will again be the used in war. But this bad news may contain a “silver lining” of good news. Unlike a general nuclear war that might have occurred during the Cold War, such a nuclear event now would probably not mark the end of civilization (or of humanity), due to the great reductions in nuclear forces achieved at the end of the Cold War. Furthermore, politics on “the day after” could have immense potential for positive change. The survivors would not be likely to envy the dead, but would surely have a greatly renewed resolution for “never again.” Such an event, completely unpredictable in its particulars, would unambiguously put the nuclear-political question back at the top of the world political agenda. It would unmistakeably remind leading states of their vulnerability It might also trigger more robust efforts to achieve the global regulation of nuclear capability. Like the bombings of Hiroshima and Nagasaki that did so much to catalyze the elevated concern for nuclear security in the early Cold War, and like the experience “at the brink” in the Cuban Missile Crisis of 1962, the now bubbling nuclear caldron holds the possibility of inaugurating a major period of institutional innovation and adjustment toward a fully “bombs away” future.

#### Superior studies- theirs are confirmation-bias laden and repeatedly disproven

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Nuclear Winter burst on the academic scene in December 1983 with the publication of the hypothesis in the prestigious journal Science. It was accompanied by a study by Paul Ehrlich, et al. that hinted that it might cause the extinction of human life on the planet. MCANW stands for Medical Campaign Against Nuclear Weapons. Photo via Wellcome Images. The five authors of the Nuclear Winter hypothesis were labeled TTAPS, using the initials of their family names (T stands for Owen Toon and P stands for Jim Pollak, both Ph.D. students of Carl Sagan at Cornell University.) Carl Sagan himself was the main author and driving force. Actually, Sagan had scooped the Science paper by publishing the gist of the hypothesis in Parade magazine, which claimed a readership of 50 million! Previously, Sagan had briefed people in public office and elsewhere, so they were all primed for the popular reaction, which was tremendous. Many of today's readers may not remember Carl Sagan. He was a brilliant astrophysicist but also highly political. Imagine Al Gore, but with an excellent science background. Sagan had developed and narrated a television series called Cosmos that popularized astrophysics and much else, including cosmology, the history of the universe. He even suggested the possible existence of extraterrestrial intelligence and started a listening project called SETI (Search for Extraterrestrial Intelligence). SETI is still searching today and has not found any evidence so far. Sagan became a sort of icon; many people in the U.S. and abroad knew his name and face. Carl Sagan also had another passion: saving humanity from a general nuclear war, a laudable aim. He had been arguing vigorously and publicly for a "freeze" on the production of more nuclear weapons. President Ronald Reagan outdid him and negotiated a nuclear weapons reduction with the USSR. In the meantime, much excitement was stirred up by Nuclear Winter. Study after study tried to confirm and expand the hypothesis, led by the Defense Department (DOD), which took the hypothesis seriously and spent millions of dollars on various reports that accepted Nuclear Winter rather uncritically. The National Research Council (NRC) of the National Academy of Sciences published a report that put in more quantitative detail. It enabled critics of the hypothesis to find flaws – and many did. The names Russell Seitz, Dick Wilson (both of Cambridge, Mass.), Steve Schneider (Palo Alto, Calif.), and Bob Ehrlich (Fairfax, Va.) (no relation to Paul Ehrlich) come to mind. The hypothesis was really "politics disguised as science." The whole TTAPS scheme was contrived to deliver the desired consequence. It required the smoke layer to be of just the right thickness, covering the whole Earth, and lasting for many months. The Kuwait oil fires in 1991 produced a lot of smoke, but it rained out after a few days. I had a mini-debate with Sagan on the TV program Nightline and published a more critical analysis of the whole hypothesis in the journal Meteorology & Atmospheric Physics. I don't know if Carl ever saw my paper. But I learned a lot from doing this analysis that was useful in later global warming research. For example, the initial nuclear bursts inject water vapor into the stratosphere, which turns into contrail-like cirrus clouds. That actually leads to a strong initial warming and a "nuclear summer."

#### Industrial civilization wouldn’t recover.

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Imagine that the world as we know it ends tomorrow. There’s a global catastrophe: a pandemic virus, an asteroid strike, or perhaps a nuclear holocaust. The vast majority of the human race perishes. Our civilisation collapses. The post-apocalyptic survivors find themselves in a devastated world of decaying, deserted cities and roving gangs of bandits looting and taking by force. Bad as things sound, that’s not the end for humanity. We bounce back. Sooner or later, peace and order emerge again, just as they have time and again through history. Stable communities take shape. They begin the agonising process of rebuilding their technological base from scratch. But here’s the question: how far could such a society rebuild? Is there any chance, for instance, that a post-apocalyptic society could reboot a technological civilisation? Let’s make the basis of this thought experiment a little more specific. Today, we have already consumed the most easily drainable crude oil and, particularly in Britain, much of the shallowest, most readily mined deposits of coal. Fossil fuels are central to the organisation of modern industrial society, just as they were central to its development. Those, by the way, are distinct roles: even if we could somehow do without fossil fuels now (which we can’t, quite), it’s a different question whether we could have got to where we are without ever having had them. So, would a society starting over on a planet stripped of its fossil fuel deposits have the chance to progress through its own Industrial Revolution? Or to phrase it another way, what might have happened if, for whatever reason, the Earth had never acquired its extensive underground deposits of coal and oil in the first place? Would our progress necessarily have halted in the 18th century, in a pre-industrial state? It’s easy to underestimate our current dependence on fossil fuels. In everyday life, their most visible use is the petrol or diesel pumped into the vehicles that fill our roads, and the coal and natural gas which fire the power stations that electrify our modern lives. But we also rely on a range of different industrial materials, and in most cases, high temperatures are required to transform the stuff we dig out of the ground or harvest from the landscape into something useful. You can’t smelt metal, make glass, roast the ingredients of concrete, or synthesise artificial fertiliser without a lot of heat. It is fossil fuels – coal, gas and oil – that provide most of this thermal energy. In fact, the problem is even worse than that. Many of the chemicals required in bulk to run the modern world, from pesticides to plastics, derive from the diverse organic compounds in crude oil. Given the dwindling reserves of crude oil left in the world, it could be argued that the most wasteful use for this limited resource is to simply burn it. We should be carefully preserving what’s left for the vital repertoire of valuable organic compounds it offers. But my topic here is not what we should do now. Presumably everybody knows that we must transition to a low-carbon economy one way or another. No, I want to answer a question whose interest is (let’s hope) more theoretical. Is the emergence of a technologically advanced civilisation necessarily contingent on the easy availability of ancient energy? Is it possible to build an industrialised civilisation without fossil fuels? And the answer to that question is: maybe – but it would be extremely difficult. Let’s see how. We’ll start with a natural thought. Many of our alternative energy technologies are already highly developed. Solar panels, for example, represent a good option today, and are appearing more and more on the roofs of houses and businesses. It’s tempting to think that a rebooted society could simply pick up where we leave off. Why couldn’t our civilisation 2.0 just start with renewables? Well, it could, in a very limited way. If you find yourself among the survivors in a post-apocalyptic world, you could scavenge enough working solar panels to keep your lifestyle electrified for a good long while. Without moving parts, photovoltaic cells require little maintenance and are remarkably resilient. They do deteriorate over time, though, from moisture penetrating the casing and from sunlight itself degrading the high-purity silicon layers. The electricity generated by a solar panel declines by about 1 per cent every year so, after a few generations, all our hand-me-down solar panels will have degraded to the point of uselessness. Then what? New ones would be fiendishly difficult to create from scratch. Solar panels are made from thin slices of extremely pure silicon, and although the raw material is common sand, it must be processed and refined using complex and precise techniques – the same technological capabilities, more or less, that we need for modern semiconductor electronics components. These techniques took a long time to develop, and would presumably take a long time to recover. So photovoltaic solar power would not be within the capability of a society early in the industrialisation process. Perhaps, though, we were on the right track by starting with electrical power. Most of our renewable-energy technologies produce electricity. In our own historical development, it so happens that the core phenomena of electricity were discovered in the first half of the 1800s, well after the early development of steam engines. Heavy industry was already committed to combustion-based machinery, and electricity has largely assumed a subsidiary role in the organisation of our economies ever since. But could that sequence have run the other way? Is there some developmental requirement that thermal energy must come first? On the face of it, it’s not beyond the bounds of possibility that a progressing society could construct electrical generators and couple them to simple windmills and waterwheels, later progressing to wind turbines and hydroelectric dams. In a world without fossil fuels, one might envisage an electrified civilisation that largely bypasses combustion engines, building its transport infrastructure around electric trains and trams for long-distance and urban transport. I say ‘largely’. We couldn’t get round it all together. When it comes to generating the white heat demanded by modern industry, there are few good options but to burn stuff While the electric motor could perhaps replace the coal-burning steam engine for mechanical applications, society, as we’ve already seen, also relies upon thermal energy to drive the essential chemical and physical transformations it needs. How could an industrialising society produce crucial building materials such as iron and steel, brick, mortar, cement and glass without resorting to deposits of coal? You can of course create heat from electricity. We already use electric ovens and kilns. Modern arc furnaces are used for producing cast iron or recycling steel. The problem isn’t so much that electricity can’t be used to heat things, but that for meaningful industrial activity you’ve got to generate prodigious amounts of it, which is challenging using only renewable energy sources such as wind and water. An alternative is to generate high temperatures using solar power directly. Rather than relying on photovoltaic panels, concentrated solar thermal farms use giant mirrors to focus the sun’s rays onto a small spot. The heat concentrated in this way can be exploited to drive certain chemical or industrial processes, or else to raise steam and drive a generator. Even so, it is difficult (for example) to produce the very high temperatures inside an iron-smelting blast furnace using such a system. What’s more, it goes without saying that the effectiveness of concentrated solar power depends strongly on the local climate. No, when it comes to generating the white heat demanded by modern industry, there are few good options but to burn stuff. But that doesn’t mean the stuff we burn necessarily has to be fossil fuels. Let’s take a quick detour into the pre-history of modern industry. Long before the adoption of coal, charcoal was widely used for smelting metals. In many respects it is superior: charcoal burns hotter than coal and contains far fewer impurities. In fact, coal’s impurities were a major delaying factor on the Industrial Revolution. Released during combustion, they can taint the product being heated. During smelting, sulphur contaminants can soak into the molten iron, making the metal brittle and unsafe to use. It took a long time to work out how to treat coal to make it useful for many industrial applications. And, in the meantime, charcoal worked perfectly well. And then, well, we stopped using it. In retrospect, that’s a pity. When it comes from a sustainable source, charcoal burning is essentially carbon-neutral, because it doesn’t release any new carbon into the atmosphere – not that this would have been a consideration for the early industrialists. But charcoal-based industry didn’t die out altogether. In fact, it survived to flourish in Brazil. Because it has substantial iron deposits but few coalmines, Brazil is the largest charcoal producer in the world and the ninth biggest steel producer. We aren’t talking about a cottage industry here, and this makes Brazil a very encouraging example for our thought experiment. The trees used in Brazil’s charcoal industry are mainly fast-growing eucalyptus, cultivated specifically for the purpose. The traditional method for creating charcoal is to pile chopped staves of air-dried timber into a great dome-shaped mound and then cover it with turf or soil to restrict airflow as the wood smoulders. The Brazilian enterprise has scaled up this traditional craft to an industrial operation. Dried timber is stacked into squat, cylindrical kilns, built of brick or masonry and arranged in long lines so that they can be easily filled and unloaded in sequence. The largest sites can sport hundreds of such kilns. Once filled, their entrances are sealed and a fire is lit from the top. The skill in charcoal production is to allow just enough air into the interior of the kiln. There must be enough combustion heat to drive out moisture and volatiles and to pyrolyse the wood, but not so much that you are left with nothing but a pile of ashes. The kiln attendant monitors the state of the burn by carefully watching the smoke seeping out of the top, opening air holes or sealing with clay as necessary to regulate the process. Brazil shows how the raw materials of modern civilisation can be supplied without reliance on fossil fuels Good things come to those who wait, and this wood pyrolysis process can take up to a week of carefully controlled smouldering. The same basic method has been used for millennia. However, the ends to which the fuel is put are distinctly modern. Brazilian charcoal is trucked out of the forests to the country’s blast furnaces where it is used to transform ore into pig iron. This pig iron is the basic ingredient of modern mass-produced steel. The Brazilian product is exported to countries such as China and the US where it becomes cars and trucks, sinks, bathtubs, and kitchen appliances. Around two-thirds of Brazilian charcoal comes from sustainable plantations, and so this modern-day practice has been dubbed ‘green steel’. Sadly, the final third is supplied by the non-sustainable felling of primary forest. Even so, the Brazilian case does provide an example of how the raw materials of modern civilisation can be supplied without reliance on fossil fuels. Another, related option might be wood gasification. The use of wood to provide heat is as old as mankind, and yet simply burning timber only uses about a third of its energy. The rest is lost when gases and vapours released by the burning process blow away in the wind. Under the right conditions, even smoke is combustible. We don’t want to waste it. Better than simple burning, then, is to drive the thermal breakdown of the wood and collect the gases. You can see the basic principle at work for yourself just by lighting a match. The luminous flame isn’t actually touching the matchwood: it dances above, with a clear gap in between. The flame actually feeds on the hot gases given off as the wood breaks down in the heat, and the gases combust only once they mix with oxygen from the air. Matches are fascinating when you look at them closely. Wartime gasifier cars could achieve about 1.5 miles per kilogram. Today’s designs improve upon this To release these gases in a controlled way, bake some timber in a closed container. Oxygen is restricted so that the wood doesn’t simply catch fire. Its complex molecules decompose through a process known as pyrolysis, and then the hot carbonised lumps of charcoal at the bottom of the container react with the breakdown products to produce flammable gases such as hydrogen and carbon monoxide. The resultant ‘producer gas’ is a versatile fuel: it can be stored or piped for use in heating or street lights, and is also suitable for use in complex machinery such as the internal combustion engine. More than a million gasifier-powered cars across the world kept civilian transport running during the oil shortages of the Second World War. In occupied Denmark, 95 per cent of all tractors, trucks and fishing boats were powered by wood-gas generators. The energy content of about 3 kg of wood (depending on its dryness and density) is equivalent to a litre of petrol, and the fuel consumption of a gasifier-powered car is given in miles per kilogram of wood rather than miles per gallon. Wartime gasifier cars could achieve about 1.5 miles per kilogram. Today’s designs improve upon this. But you can do a lot more with wood gases than just keep your vehicle on the road. It turns out to be suitable for any of the manufacturing processes needing heat that we looked at before, such as kilns for lime, cement or bricks. Wood gas generator units could easily power agricultural or industrial equipment, or pumps. Sweden and Denmark are world leaders in their use of sustainable forests and agricultural waste for turning the steam turbines in power stations. And once the steam has been used in their ‘Combined Heat and Power’ (CHP) electricity plants, it is piped to the surrounding towns and industries to heat them, allowing such CHP stations to approach 90 per cent energy efficiency. Such plants suggest a marvellous vision of industry wholly weaned from its dependency on fossil fuel. Is that our solution, then? Could our rebooting society run on wood, supplemented with electricity from renewable sources? Maybe so, if the population was fairly small. But here’s the catch. These options all presuppose that our survivors are able to construct efficient steam turbines, CHP stations and internal combustion engines. We know how to do all that, of course – but in the event of a civilisational collapse, who is to say that the knowledge won’t be lost? And if it is, what are the chances that our descendants could reconstruct it? In our own history, the first successful application of steam engines was in pumping out coal mines. This was a setting in which fuel was already abundant, so it didn’t matter that the first, primitive designs were terribly inefficient. The increased output of coal from the mines was used to first smelt and then forge more iron. Iron components were used to construct further steam engines, which were in turn used to pump mines or drive the blast furnaces at iron foundries. And of course, steam engines were themselves employed at machine shops to construct yet more steam engines. It was only once steam engines were being built and operated that subsequent engineers were able to devise ways to increase their efficiency and shrink fuel demands. They found ways to reduce their size and weight, adapting them for applications in transport or factory machinery. In other words, there was a positive feedback loop at the very core of the industrial revolution: the production of coal, iron and steam engines were all mutually supportive. In a world without readily mined coal, would there ever be the opportunity to test profligate prototypes of steam engines, even if they could mature and become more efficient over time? How feasible is it that a society could attain a sufficient understanding of thermodynamics, metallurgy and mechanics to make the precisely interacting components of an internal combustion engine, without first cutting its teeth on much simpler external combustion engines – the separate boiler and cylinder-piston of steam engines? It took a lot of energy to develop our technologies to their present heights, and presumably it would take a lot of energy to do it again. Fossil fuels are out. That means our future society will need an awful lot of timber. An industrial revolution without coal would be, at a minimum, very difficult In a temperate climate such as the UK’s, an acre of broadleaf trees produces about four to five tonnes of biomass fuel every year. If you cultivated fast-growing kinds such as willow or miscanthus grass, you could quadruple that. The trick to maximising timber production is to employ coppicing – cultivating trees such as ash or willow that resprout from their own stump, becoming ready for harvest again in five to 15 years. This way you can ensure a sustained supply of timber and not face an energy crisis once you’ve deforested your surroundings. But here’s the thing: coppicing was already a well-developed technique in pre-industrial Britain. It couldn’t meet all of the energy requirements of the burgeoning society. The central problem is that woodland, even when it is well-managed, competes with other land uses, principally agriculture. The double-whammy of development is that, as a society’s population grows, it requires more farmland to provide enough food and also greater timber production for energy. The two needs compete for largely the same land areas. We know how this played out in our own past. From the mid-16th century, Britain responded to these factors by increasing the exploitation of its coal fields – essentially harvesting the energy of ancient forests beneath the ground without compromising its agricultural output. The same energy provided by one hectare of coppice for a year is provided by about five to 10 tonnes of coal, and it can be dug out of the ground an awful lot quicker than waiting for the woodland to regrow. It is this limitation in the supply of thermal energy that would pose the biggest problem to a society trying to industrialise without easy access to fossil fuels. This is true in our post-apocalyptic scenario, and it would be equally true in any counterfactual world that never developed fossil fuels for whatever reason. For a society to stand any chance of industrialising under such conditions, it would have to focus its efforts in certain, very favourable natural environments: not the coal-island of 18th-century Britain, but perhaps areas of Scandinavia or Canada that combine fast-flowing streams for hydroelectric power and large areas of forest that can be harvested sustainably for thermal energy. Even so, an industrial revolution without coal would be, at a minimum, very difficult. Today, use of fossil fuels is actually growing, which is worrying for a number of reasons too familiar to rehearse here. Steps towards a low-carbon economy are vital. But we should also recognise how pivotal those accumulated reservoirs of thermal energy were in getting us to where we are. Maybe we could have made it the hard way. A slow-burn progression through the stages of mechanisation, supported by a combination of renewable electricity and sustainably grown biomass, might be possible after all. Then again, it might not. We’d better hope we can secure the future of our own civilisation, because we might have scuppered the chances of any society to follow in our wake.

#### Newest research proves even worst-case nuclear winter is survivable – assumes secondary effects, fallout, arsenal sizes,

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Case 2: 90% population loss, infrastructure damage, and extreme climate change (e.g. nuclear war that caused nuclear winter) In a scenario in which a catastrophe causes the deaths of 90% of the population (800 million survivors), major infrastructure damage, and climate change — for example, a severe, global nuclear war that caused a nuclear winter — I believe the question of whether humans would be able to meet their basic needs becomes more difficult.[14] The questions I consider for this scenario are: What is the likelihood that survivors are able to continue to survive using traditional forms of agriculture, given a catastrophe that causes severe infrastructure damage and climate change? What is the likelihood that radiation causes extinction? What is the likelihood that humanity would survive in the event of conflict immediately following the catastrophe? What is the likelihood that survivors are able to continue to survive using traditional forms of agriculture? Time spent on this section: 2–3 hours Types of sources: Academic literature, non-academic reports, and expert interviews Expert judgment: Several experts, including ALLFED director David Denkenberger, have affirmed this conclusion — they do not expect humanity to dip below the minimum viable population even in relatively extreme sun-blocking scenarios. Literature review: The nature of all of the catastrophes we know of that would cause extreme global cooling (e.g. nuclear winter, asteroid impacts) **would have unevenly distributed impacts** — causing extreme global cooling in some parts of the world, but more moderate cooling in others. For example, in the case of a nuclear war between the US and Russia, nuclear winter models suggest that the most **severe climate effects would be limited** to the Northern Hemisphere, where temperatures would fall by 10–30 degrees C. But in the Southern Hemisphere, and especially at the equator, those effects would be much less severe: between 5–10 degrees Celsius. With heterogeneous impacts like this, it’s likely that agriculture would still be possible in some regions — especially in New Zealand and Australia, and possibly in South America and Central Africa.[15] To be clear, I’m describing a very grim scenario, in which basically everyone in the Northern Hemisphere — and in many parts of the Southern Hemisphere — would be unable to grow food using standard agricultural techniques. Given this, I expect there would be mass starvation and violent competition and conflict until a new equilibrium was reached, one where the remaining survivors didn’t exceed the Earth’s carrying capacity. While I expect this would be a truly terrible period of widespread suffering, I believe this equilibrium would be reached long before the population got anywhere near the minimum viable population. My best guess is the population would fall to hundreds of thousands to tens of millions, but not much lower. While I haven’t looked into this much, I feel fairly convinced that hundreds of thousands or **millions** of people **could survive** using traditional approaches to agriculture in parts of the world with more moderate climate effects (and basic mitigation strategies, like switching to crop types that are more resilient to temperature and precipitation fluctuations). And as with Case 1, at least some of the survivors in a Case 2 scenario would probably be able to survive the immediate aftermath of a catastrophe that caused civilizational collapse by exploiting food and other supplies in stores and larger stockpiles. This would give survivors some buffer time to learn additional skills required to survive once those supplies run out (e.g. fishing) or develop the techniques necessary to produce food using methods that don’t rely on climate factors like warm temperatures and regular precipitation. BOTEC: The longer the buffer time, the more likely humanity would be to subsequently survive. But there are a number of different considerations (relative to Case 1) that affect the calculus of just how long such a grace period would be in the context of a catastrophic event like a nuclear war that killed 90% of people and caused a nuclear winter. So I’ve done a similar exercise to the one above where I try to account for some of those differences. Note: As above, the following BOTEC relies on particularly poor sources, makes a bunch of dubious assumptions (discussed more below), and I’m not confident I’ve thought of all of the most important supplies. It should be considered very rough. TABLE5 See table note here.[16] Bottom line: I think it’s extremely likely that these supplies would last somewhere between around a year and a decade or more. I expect it would be closer to the lower end, given that competition and violence could lead to the depletion of supplies more quickly than if the population were reduced to a smaller number by the catastrophe directly. All this in mind, I think it is very likely that the survivors would be able to learn enough during the grace period to be able to feed and shelter themselves ~indefinitely. What is the likelihood that radiation causes extinction? Time spent on this section: 2–3 hours Types of sources: Academic papers, Wikipedia, and interviews with experts Literature review: In the aftermath of a nuclear war, radioactive fallout from the nuclear detonations would have long-lasting health impacts. In **the most extreme** nuclear war **scenario**s considered by academics (a nuclear war between the US and Russia and their allies, using 10,000 megatons (MT) of nuclear bombs), approximately 30% of the geographic area in the Northern Hemisphere would have enough fallout to be lethal to any adult in the area (Ehrlich et al., 1983). The current US and Russian nuclear arsenals don’t currently have that kind of megatonnage (they currently have closer to 2,500 MT). If we naively assume that radiation scales linearly, we might expect a modern day US-Russia nuclear war to contaminate up to 7.5% of the land area of the Northern Hemisphere. This may not sound like much, but consider that 95% of the world’s population lives on just 10% of its land area — meaning that 7.5% of land area could be home to millions or even billions of people. What’s more, tens to hundreds of millions more might be exposed to enough radiation to be more susceptible to cancer for the rest of their lives. On top of this, there are currently around 440 civilian nuclear power reactors scattered around the world, and likely tens or hundreds more military reactors. These have fail-safes and automatic shut down measures that are designed to ensure that all of the nuclear material in these reactors would be safely contained in the event of a global catastrophe that meant people stopped attending to them. Concretely, these fail safes make sure that water continues to be circulated around the nuclear fuel to ensure it doesn’t get so hot it causes a meltdown — i.e., an event where the nuclear core partially or completely melts, which might allow the nuclear fuel to breach its multiple layers of containment and leak out into the environment. If fuel did reach the environment, the radioactive fallout could spread across continents, creating exposure levels ranging from immediately fatal (in areas ranging from tens to thousands of square kilometers) to non-lethal but causing potential higher rates of cancer and infertility. But some of these fail-safes could plausibly fail during a catastrophe that caused infrastructure damage (or afterward, if any components of the fail system degraded). For example, some nuclear reactors rely on backup generators to power the pumps that keep water circulating in the core of the reactor. If those backup generators eventually all broke down, the reactor might melt down. I currently don’t have a good sense of how likely these failures would be. Newer nuclear reactors rely on more robust safety systems, with parts that wouldn’t break down as easily. And all nuclear reactor safety systems are designed to account for infrastructure damage caused by earthquakes and other physical shocks. But in a large-scale nuclear war, it seems very plausible that at least some nuclear reactors would melt down. My best guess is that this wouldn’t happen at a large scale, but even if it did, some areas would likely be far enough away from reactors to be spared the radioactive contamination. For example, Australia has just one nuclear reactor. Even if that reactor were to melt down, much of Australia would likely remain uncontaminated (Australia is just under 3 million square miles, and the Chernobyl meltdown is estimated to have contaminated under 60,000 square miles; and only a much smaller fraction of that area was sufficiently contaminated as to be lethal to humans). Bottom line: While radioactive fallout from nuclear detonations and power plant meltdowns would increase the death toll in the years following the collapse, I expect it **wouldn’t be** widespread enough to be immediately **fatal to everyone**,

nor would it cause fertility rates or life expectancy to decrease enough to threaten extinction. And at the very least, **some** areas **are sufficiently far away as to be** relatively **safe** from radioactive fallout. What is the likelihood that humanity would survive in the event of conflict immediately following the catastrophe? Time spent on this section: 1–2 hours Types of sources: Academic literature, expert interviews, and speculation Historical base rate: In Case 2, it seems slightly more plausible to me that violence would lead to human extinction than in Case 1, but still fairly unlikely. I don’t think human extinction could be caused by a conflict fought with conventional weapons; **there would** just **be** **too many survivors (~800 million)** to be killed in conventional warfare (compare this to WWI and WWII, during which ~20 million and ~75 million people were killed, respectively). Weapons of mass destruction: My best guess is that the only way violence in the wake of a Case 2 civilizational collapse could directly lead to human extinction is if one group of **survivors** had access to and deployed weapons of mass destruction. This seems unlikely to me, first because it seems hard to imagine a group of survivors incapable of recovering critical infrastructure — and barely capable of meeting even their basic needs — would be able to successfully deploy weapons of mass destruction (though I’m not very confident about this). Second, it’s hard to imagine a scenario where the use of weapons of mass destruction kills millions of survivors, spread all over the world, without modern technologies like transportation. For example, with potentially many survivor groups, it seems hard to imagine how nuclear detonations would kill ~everyone despite the fact that the groups would likely be spread out all over the world, potentially in small bands that can’t each be individually targeted. Similarly, it’s hard to imagine how a pathogen could spread ~everywhere when survivors would likely have greatly reduced mobility (the latter isn’t obviously impossible, but it at least seems exceedingly difficult to me). There’s one counterargument I find somewhat persuasive, which is that it seems possible that all of the survivors might be confined to a relatively small area (for example, if only a small fraction of the Earth’s land area is habitable), making them more vulnerable to a single, large attack. If this were the case, it’s easier for me to imagine that the use of weapons of mass destruction could kill all of the remaining survivors. This would presumably mean the aggressors would be killing themselves, which makes it seem even less likely to me. But we’ve seen humans come dangerously close to threatening their own survival before, often because human aggressors aren’t always good at predicting how cascading effects could threaten their survival as well. A random example to make this concrete: If all of the survivors of a nuclear war were confined to Australia, which might be less impacted by a nuclear winter, one group might choose to use nuclear weapons against another group, not realizing that the radioactive fallout or further climate change could make Australia uninhabitable, even for them. Bottom line: I expect the survivors in Case 2 would not deploy weapons of mass destruction against their competitors, as it would likely pose a pretty big risk to the aggressor as well as the target. But I’m uncertain about this — humans have come close to making similarly self-destructive choices before. Thankfully, even if one group did use weapons of mass destruction against their competitors, I still think it’s very unlikely that their use would cause human extinction. This is because except in a few very specific and very strange scenarios, I expect the survivors would be too geographically distributed and disconnected to be wiped out by a single act of aggression. I therefore expect the result would be a much higher death toll, but not extinction. Concrete example: A large nuclear war that causes a nuclear winter So what, concretely, do I think would happen in the event of a catastrophe like a nuclear war that led to the death of 90% of the population, and caused severe infrastructure damage and significant global cooling? I expect that, in addition to the billions of people killed in the initial catastrophe, hundreds of millions or more would likely die in the famines and violent competition that followed. But my best guess is that hundreds of thousands to hundreds of millions of the survivors of the initial catastrophe would survive this violent period. I think it’s extremely likely these survivors would be able to support themselves using leftover food stocks and supplies, before eventually working out how to feed themselves through traditional agriculture and fishing and/or modified agriculture (using methods that don’t rely on climate factors like warm temperatures and regular precipitation). **All of the catastrophes** we know of **that would lead to extreme cooling** would only do so **for** 1–**10 years, and agriculture would become possible again once the climate began to return to normal**. At that point, it seems even more likely that the surviving humans would be able to meet their own basic needs by returning to traditional forms of agriculture. My key uncertainties are around whether I’m putting too much weight on the idea that humans would figure out how to subsist without traditional agriculture just because it’s technically possible, and whether conflict could lead to extinction through channels I haven’t foreseen. Another toy calculation suggests that these **uncertainties** probably **aren’t troubling enough to change my bottom line**. Note: I again assume each group’s fate is independent of the fates of other groups. I actually think this is a pretty reasonable assumption in this case. I expect that the **survivors** of a catastrophe like a severe nuclear war **would end up somewhat spread out** (at least across the Southern Hemisphere), as doing so would create less competition for resources within a smaller area (I discuss this more later). The farther apart the surviving groups are, the less likely they are to be affected by the same shocks (natural disasters, disease outbreaks, conflict). Additionally, in the event of a catastrophe like a nuclear war, transportation, communication, and other technologies that facilitate contact between geographically distributed groups would be enormously limited. This would further limit the extent to which each group’s fate ended up relating to another’s. There would be other sources of variation between groups that made their fates less correlated: Some groups might be made up mostly of farmers, while others will be made up of lawyers, some groups will tend toward cooperation, while others toward conflict, plus pure randomness (e.g. some groups might have a high proportion of survivors with genetic immunity to a particular disease). But there are also factors that point in the other direction — factors that suggest the surviving groups would be at least somewhat correlated. For example, nuclear winter climate conditions, while nonuniform, would nonetheless impact all surviving groups. Similarly, more severe natural disasters might affect large regions, meaning that at least all of the survivor groups at the regional level might end up experiencing very similar challenges to survival simultaneously. Likewise, there might be things about "human nature" that would be shared amongst all survivors. For example, it’s possible that all of the survivors, having witnessed the initial catastrophe, would have similar psychological experiences — like shock, stress, and social distrust, among others — that would make it more difficult to survive and cooperate. As above, the higher the true correlation between survivor groups, the more my toy calculations will cause me to underestimate the probability that all of the survivor groups would be wiped out. TABLE6 With 800 million survivors, the degree of pessimism you have to have about their ability to survive to end up believing that no groups would survive indefinitely is actually kind of extreme. The exact beliefs you’d have to have would depend on whether survivors were concentrated into a few big groups, or distributed in many smaller ones. Specifically: Even if you thought any given group of 100, 1,000, or 10,000 survivors had a 99% chance of being wiped out, it would still be virtually guaranteed that at least one group would survive. If you thought there was a 99% chance that any one of 800 groups of 100,000 people would be wiped out, there would still only be a 1 in 3,000 chance of extinction. The probability of extinction is higher (45%) if you believe that larger groups of 10 million would also have a 99% chance of being wiped out. But, again, to hold that view, you’d have to think that out of a group of 10 million people (again, bigger than the largest US city), not even a few hundred of those people would overcome the obstacles of the post-collapse environment (how to fish, how to farm despite global cooling, avoiding being killed by a hurricane or drought). I do not find this view very plausible. Similarly, the probability of extinction is very high indeed if you think that any given group of 100 million survivors has a 99% chance of being wiped out. Again, to believe extinction risk was that high, you’d have to think that there would be a 99% chance that none of the 100 million people would work out how to survive (for reference, only 14 countries have a population of 100 million or higher). Given all of this, my subjective judgment is that **it’s very unlikely that this scenario would more or less directly lead to human extinction.**