### framework

#### observation 1 – because the resolution uses the word “just”, the most important value in today’s debate is justice

#### In order to evaluate justice, we should use the criterion of utilitarianism

#### observation 2 – to best understand the resolution, defining important terms is key:

#### Justice means maximization of welfare

**Mill 63** (John Stuart Mill, English philosopher, “Justice”, Uilitarianism, Wikipedia, 1864, <https://en.wikipedia.org/wiki/Justice?scrlybrkr#:~:text=According%20to%20the%20utilitarian%2C%20justice,is%20taken%20impartially%20into%20account>.) // el

According to the utilitarian, justice requires the maximization of the total or average welfare across all relevant individuals.[16] This may require sacrifice of some for the good of others, so long as everyone's good is taken impartially into account. Utilitarianism, in general, says that the standard of justification for actions, institutions, or the whole world, is impartial welfare consequentialism, and only indirectly, if at all, to do with rights, property, need, or any other non-utilitarian criterion. These other criteria might be indirectly important, to the extent that human welfare involves them. But even then, such demands as human rights would only be elements in the calculation of overall welfare, not uncrossable barriers to action.

#### Justice is a prerequisite to every other value

Burns 89 (Robert P. Burns, Professor of Law, Northwestern University School of Law, NORTHWESTERN UNIVERSITY LAW REVIEW , Fall 1988 / Winter 1989, p. 238)

Income maintenance policy must, of course, be concerned with ideals other than justice. Nonetheless, according to Rawls, "justice is the first virtue of social institutions" and its dictates have an absolute priority over other social goals: if they cannot be reconciled, then the requirements of justice must be met. Indeed, reconciliation could not, for Rawls, involve any compromise of the demands of justice.

### contention 1

#### contention 1 is the benefits of capitalism

#### Free market, free space! Space-for-space economic growth is sustainable and critical to economic preservation

Weinzierl and Sarang 21 – *Joseph and Jacqueline Elbling Professor of Business Administration at HBS and a Research Associate at the NBER; Research Associate at Harvard Business School and the Lunar Exploration Projects Lead for the MIT Space Exploration Initiative* (Matt Weinzierl and Mehak Sarang, 2-12-2021, "The Commercial Space Age Is Here," Harvard Business Review, https://hbr.org/2021/02/the-commercial-space-age-is-here)//kh

There’s no shortage of hype surrounding the commercial space industry. But while tech leaders promise us moon bases and settlements on Mars, the space economy has thus far remained distinctly local — at least in a cosmic sense. Last year, however, we crossed an important threshold: For the first time in human history, humans accessed space via a vehicle built and owned not by any government, but by a private corporation with its sights set on affordable space settlement. It was the first significant step towards building an economy both in space and for space. The implications — for business, policy, and society at large — are hard to overstate.

In 2019, 95% of the estimated $366 billion in revenue earned in the space sector was from the space-for-earth economy: that is, goods or services produced in space for use on earth. The space-for-earth economy includes telecommunications and internet infrastructure, earth observation capabilities, national security satellites, and more. This economy is booming, and though research shows that it faces the challenges of overcrowding and monopolization that tend to arise whenever companies compete for a scarce natural resource, projections for its future are optimistic. Decreasing costs for launch and space hardware in general have enticed new entrants into this market, and companies in a variety of industries have already begun leveraging satellite technology and access to space to drive innovation and efficiency in their earthbound products and services.

In contrast, the space-for-space economy — that is, goods and services produced in space for use in space, such as mining the Moon or asteroids for material with which to construct in-space habitats or supply refueling depots — has struggled to get off the ground. As far back as the 1970s, research commissioned by NASA predicted the rise of a space-based economy that would supply the demands of hundreds, thousands, even millions of humans living in space, dwarfing the space-for-earth economy (and, eventually, the entire terrestrial economy as well). The realization of such a vision would change how all of us do business, live our lives, and govern our societies — but to date, we’ve never even had more than 13 people in space at one time, leaving that dream as little more than science fiction.

Today, however, there is reason to think that we may finally be reaching the first stages of a true space-for-space economy. SpaceX’s recent achievements (in cooperation with NASA), as well as upcoming efforts by Boeing, Blue Origin, and Virgin Galactic to put people in space sustainably and at scale, mark the opening of a new chapter of spaceflight led by private firms. These firms have both the intention and capability to bring private citizens to space as passengers, tourists, and — eventually — settlers, opening the door for businesses to start meeting the demand those people create over the next several decades with an array of space-for-space goods and services.

Welcome to the (Commercial) Space Age

In our recent research, we examined how the model of centralized, government-directed human space activity born in the 1960s has, over the last two decades, made way for a new model, in which public initiatives in space increasingly share the stage with private priorities. Centralized, government-led space programs will inevitably focus on space-for-earth activities that are in the public interest, such as national security, basic science, and national pride. This is only natural, as expenditures for these programs must qbe justified by demonstrating benefits for citizens — and the citizens these governments represent are (nearly) all on earth.

In contrast to governments, the private sector is eager to put people in space to pursue their own personal interests, not the state’s — and then supply the demand they create. This is the vision driving SpaceX, which in its first twenty years has entirely upended the rocket launch industry, securing 60% of the global commercial launch market and building ever-larger spacecraft designed to ferry passengers not just to the International Space Station (ISS), but also to its own promised settlement on Mars.

Today, the space-for-space market is limited to supplying the people who are already in space: that is, the handful of astronauts employed by NASA and other government programs. While SpaceX has grand visions of supporting large numbers of private space travelers, their current space-for-space activities have all been in response to demand from government customers (i.e., NASA). But as decreasing launch costs enable companies like SpaceX to leverage economies of scale and put more people into space, growing private sector demand (that is, tourists and settlers, rather than government employees) could turn these proof-of-concept initiatives into a sustainable, large-scale industry.

This model — of selling to NASA with the hopes of eventually creating and expanding into a larger private market — is exemplified by SpaceX, but the company is by no means the only player taking this approach. For instance, while SpaceX is focused on space-for-space transportation, another key component of this burgeoning industry will be manufacturing.

Made In Space, Inc. has been at the forefront of manufacturing “in space, for space” since 2014, when it 3D-printed a wrench onboard the ISS. Today, the company is exploring other products, such as high-quality fiber-optic cable, that terrestrial customers may be willing to pay to have manufactured in zero-gravity. But the company also recently received a $74 million contract to 3D-print large metal beams in space for use on NASA spacecraft, and future private sector spacecraft will certainly have similar manufacturing needs which Made In Space hopes to be well-positioned to fulfill. Just as SpaceX has begun by supplying NASA but hopes to eventually serve a much larger, private-sector market, Made In Space’s current work with NASA could be the first step along a path towards supporting a variety of private-sector manufacturing applications for which the costs of manufacturing on earth and transporting into space would be prohibitive.

Another major area of space-for-space investment is in building and operating space infrastructure such as habitats, laboratories, and factories. Axiom Space, a current leader in this field, recently announced that it would be flying the “first fully private commercial mission to space” in 2022 onboard SpaceX’s Crew Dragon Capsule. Axiom was also awarded a contract for exclusive access to a module of the ISS, facilitating its plans to develop modules for commercial activity on the station (and eventually, beyond it).

This infrastructure is likely to spur investment in a wide array of complementary services to supply the demand of the people living and working within it. For example, in February 2020, Maxar Technologies was awarded a $142 million contract from NASA to develop a robotic construction tool that would be assembled in space for use on low-Earth orbit spacecraft. Private sector spacecraft or settlements will no doubt have need for a variety of similar construction and repair tools.

And of course, the private sector isn’t just about industrial products. Creature comforts also promise to be an area of rapid growth, as companies endeavor to support the human side of life in the harsh environment of space. In 2015, for example, Argotec and Lavazza collaborated to build an espresso machine that could function in the zero-gravity environment of the ISS, delivering a bit of everyday luxury to the crew.

To be sure, people have dreamt of using the vacuum and weightlessness of space to source or make things that cannot be made on earth for half a century, and time and again the business case has failed to pan out. Skepticism is natural. Those failures, however, have been in space-for-earth applications. For example, two startups of the 2010s, Planetary Resources, Inc. and Deep Space Industries, recognized the potential of space mining early on. For both companies, however, the lack of a space-for-space economy meant that their near-term survival depended on selling mined material — precious metals or rare elements — to earthbound customers. When it became clear that demand was insufficient to justify the high costs, funding dried up, and both companies pivoted to other ventures.

These were failures of space-for-earth business models — but the demand for in-space mining of raw building material, metals, and water will be enormous once humans are living in space (and are therefore far cheaper to supply). In other words, when people are living and working in space, we are likely to look back on these early asteroid mining companies less as failures and more as simply ahead of their time.

Seizing the Space-for-Space Opportunity

The opportunity presented by the space-for-space economy is huge — but it could easily be missed. To seize this moment, policymakers must provide regulatory and institutional frameworks that will enable the risk-taking and innovation necessary for a decentralized, private-sector-driven space economy. There are three specific policy areas we believe will be especially important:

1. Enabling private individuals to take on greater risk than would be tolerable for government-employed astronauts.

First, as part of a general shift to that more decentralized, market-oriented space sector, policymakers should consider allowing private space tourists and settlers to voluntarily take on more risk than states would tolerate for government-employed astronauts. In the long run, ensuring high safety levels will be essential to convince larger numbers of people to travel or live in space, but in the early years of exploration, too great an aversion to risk will stop progress before it starts.

An instructive analogy can be found in how NASA works with its contractors: In the mid-2000s, NASA shifted from using cost-plus contracts (in which NASA shouldered all the economic risk of investing in space) to fixed-price contracts (in which risk was distributed between NASA and their contractors). Because of private companies’ greater tolerance for risk, this shift catalyzed a burst of activity in the sector — sometimes referred to as “New Space.” A similar shift in how we approach voluntary risk-taking by private-sector astronauts may be necessary in order to launch the space-for-space economy.

#### Growth is sustainable.

Hartford, 20—economics columnist for the Financial Times, citing Diane Coyle, Bennett Professor of Public Policy at the University of Cambridge, Vaclav Smil, Distinguished Professor Emeritus in the Faculty of Environment at the University of Manitoba, Chris Goodall, English businessman, author and expert on new energy technologies, alumnus of St Dunstan's College, University of Cambridge, and Harvard Business School, and Jesse Ausubel, Director and Senior Research Associate of the Program for the Human Environment of Rockefeller University (Tim, “Two cheers for the dematerialising economy,” <https://www.ft.com/content/04858216-322e-11ea-9703-eea0cae3f0de>, dml)

If past trends continue, the world’s gross domestic product will be about twice as big by 2040 as it is today. That’s the sort of growth rate that translates to 30-fold growth over a century, or by a factor of a thousand over two centuries.

Is that miraculous, or apocalyptic? In itself, neither. GDP is a synthetic statistic, invented to help us put a measuring rod up against the ordinary business of life. It measures neither the energy and resource consumption that might worry us, nor the things that really lead to human flourishing.

That disconnection from what matters might be a problem if politicians strove to maximise GDP, but they don’t — otherwise they would have hesitated before imposing austerity in the face of a financial crisis, launching trade wars or getting Brexit done. Economic policymaking has flaws, but an obsession with GDP is not one of them.

Nevertheless the exponential expansion of GDP is indirectly important, because GDP growth is correlated with things that do matter, good and bad. Economic growth has long been associated with unsustainable activities such as carbon dioxide emissions and the consumption of metals and minerals.

But GDP growth is also correlated with the good things in life: in the short run, an economy that is creating jobs; in the long run, more important things. GDP per capita is highly correlated with indicators such as the Social Progress Index. The SPI summarises a wide range of indicators from access to food, shelter, health and education to vital freedoms of choice and from discrimination. All the leading countries in the Social Progress database are rich. All the strugglers are desperately poor.

So the prospect of a doubling of world GDP matters, not for its own sake, but for what it implies — an expansion of human flourishing, and the risk of environmental disaster.

So here’s the good news: we might be able to enjoy all the good stuff while avoiding the unsustainable environmental impact. The link between economic activity and the use of material resources is not as obvious as one might think. There are several reasons for this.

The first is that for all our seemingly insatiable desires, sometimes enough is enough. If you live in a cold house for lack of money, a pay rise lets you take off the extra cardigan and turn up the radiators. But if you win the lottery, you are not going to celebrate by roasting yourself alive.

The second is that, while free enterprise may care little for the planet, it is always on the lookout for ways to save money. As long as energy, land and materials remain costly, we’ll develop ways to use less. Aluminium beer cans weighed 85 grammes when introduced in the late 1950s. They now weigh less than 13 grammes.

The third reason is a switch to digital products — a fact highlighted back in 1997 by Diane Coyle in her book The Weightless World. The trend has only continued since then. My music collection used to require a wall full of shelves. It is now on a network drive the size of a large hardback book. My phone contains the equivalent of a rucksack full of equipment.

Dematerialisation is not automatic, of course. As Vaclav Smil calculates in his new book, Growth, US houses are more than twice as large today as in 1950. The US’s bestselling vehicle in 2018, the Ford F-150, weighs almost four times as much as 1908’s bestseller, the Model T. Let’s not even talk about the number of cars; Mr Smil reckons the global mass of automobiles sold has increased 2,500-fold over the past century.

Still, there is reason for hope. Chris Goodall’s research paper “Peak Stuff” concluded that, in the UK, “both the weight of goods entering the economy and the amounts finally ending up as waste probably began to fall from sometime between 2001 and 2003”. That figure includes the impact of imported goods.

In the US, Jesse Ausubel’s article “The Return of Nature” found falling consumption of commodities such as iron ore, aluminium, copper, steel, and paper and many others. Agricultural land has become so productive that some of it is being allowed to return to nature.

In the EU, carbon dioxide emissions fell 22 per cent between 1990 and 2017, despite the economy growing by 58 per cent. Only some of this fall is explained by the offshoring of production. (For a good summary of all this research, try Andrew McAfee’s book More From Less.)

Can we, then, relax? No. To pick a single obvious problem, global carbon dioxide emissions may be rising more slowly than GDP — but they are rising nevertheless, and they need to fall rapidly.

Yet the fact that dematerialisation is occurring is heartening. We all know what the basic policies are that would tilt the playing field in favour of smaller, lighter, lower-emission products and activities. Adopting those policies means we might actually be able to save the planet, preserve human needs, rights and freedoms — and still have plenty of fun into the bargain.

#### Spreading capitalism creates global prosperity and environmental sustainability. Abandoning it is disastrous.

Rhonheimer, 20—teaching professor at the Pontifical University of the Holy Cross (Martin, “Capitalism is Good for the Poor – and for the Environment,” <https://austrian-institute.org/en/subjects-en/catholic-social-doctrine-2/capitalism-is-good-for-the-poor-and-for-the-environment/>, dml)

It is not social policy but capitalism that has created today’s prosperity.

What is important is that what made today’s mass prosperity possible – a phenomenon unprecedented in history – was not social policy or social legislation, organised trade union pressure, or corrective interventions in the capitalist economy, but rather market capitalism itself, due to its enormous potential for innovation and the ever-increasing productivity of human labour that resulted from it.

Increasing prosperity and quality of life are always the result of increasing labour productivity. Only increased productivity enabled higher social standards, better working conditions, the overcoming of child labour, a higher level of education, and the emergence of human capital. This process of increasing triumph over poverty and the constantly rising living standards of the general masses is taking place on a global scale – but only where the market economy and capitalist entrepreneurship are able to spread.

From industrial overexploitation of nature to ecological awareness

The first phase of industrialisation and capitalism was characterised by an enormous consumption of resources and frequent overexploitation of nature, which soon gave the impression that this process could not be sustainable. Since the end of the 19th century, disaster and doom scenarios have repeatedly been put forward, but in retrospect they have proved to be wrong: The combination of technological innovation, market competition, and entrepreneurial profit-seeking (with the compulsion to constantly minimise costs) have meant that these scenarios never occurred. The ever-increasing population has been increasingly better supplied thanks to innovative technologies, ever-increasing output with lower consumption of resources less harmful to the environment – e.g. less arable land in agriculture, or oil and electricity instead of coal for rapidly increasing mobility. More recent disaster scenarios, such as those spread by reputable scientists since the late 1960s and in the 1970s, have also proved to be inaccurate.

The reason things developed differently was the always underestimated innovative dynamism of the capitalist market economy, a growing ecological awareness and, as a result, legislative intervention that took advantage of the logic of market capitalism: As a result of the ecological movement that had come out of the United States since 1970, wise legislation began to use the price mechanism to apply market incentives to internalize negative externalities. Environmental pollution was given a price-tag.

This led to an enormous decrease in air pollution and other ecological consequences of growth, which is only possible in free, market-based societies, because the production process here is characterized by competition and constant pressure to reduce costs, i.e. to the most profitable use of resources. On the other hand, all forms of socialism, i.e. a state-controlled economy, have proved to be ecological disasters and have left behind destruction of gigantic proportions, without providing the population with anything that is near comparable in prosperity, often even by destroying existing prosperity, such as happened in Venezuela.

Capitalist profit motive combined with digitalization as a solution: Increasing decoupling of growth and resource consumption

Moreover, technological innovations combined with capitalist profit-seeking and market competition have led to a new and surprising phenomenon over the past decades, which is still hardly noticed in the public debate: the decoupling of growth and resource consumption (“dematerialization”). In a wide variety of industrial sectors, the developed countries, above all the U.S., are now achieving ever greater productive output with increasingly fewer resources. This has a lot to do with technology, especially the digitalization of the economy and of our entire lives.

As the well-known MIT professor Andrew McAfee shows in his book More from Less, published in October 2019, this process also follows the logic of capitalist profit maximization. To get it going, we do not need politics, even though wise, properly incentivizing legislation can be helpful and sometimes necessary. Above all, however, it is the combination of technological innovation, capitalist profit-seeking, and market-based entrepreneurial competition that will also solve the problem of man-made global warming.

In addition, property rights and their protection are decisive for the careful use of natural resources. And where this is not possible, legal support for collective self-governing structures, in accordance with the principle of subsidiarity, are important—as is analysed by Nobel Economic Prize winner Elinor Ostrom. By contrast, the growing ideologically motivated anti-capitalist eco-activism, and the policies influenced by it, are leading in the wrong direction, distracting precisely from what would be best for the climate and the environment—and distracting us from what could help protect us against the inevitable consequences of global warming.

### contention 2

#### contention 2 is climate

#### Private space exploration tech is key to monitoring the future of climate

**Thales 20** (Thales, global leader in building a trustable future, “Monitoring Earth and Climate Change Impact from Space”, 7/7/20, <https://www.thalesgroup.com/en/group/magazine/monitoring-earth-and-climate-change-impact-space>) // el

The blue planet or the green one? As climate change is becoming one of the greatest long-term challenges that society is facing, its consequences on Earth are more and more visible, starting with its colour, when observed from space. To anticipate the consequences of global warming and protect our planet, we need precise information about how the natural environment is changing. Some Earth Observation satellites can provide reliable and highly accurate information on Earth over long periods of time and on a global scale. While meteorology was the first scientific discipline to use space capabilities in the 1960s, satellites are now able to help us monitor how healthy – or not – the planet we call home is, based on a broad range of data including weather analyses, the oceans’ colour and temperature, or measures of earth gravity. Three-quarters of the data used in numerical weather prediction models depend on satellite measurements, says OECD's quarterly magazine, OECD Observer. “It’s not something we can study from Earth. Of course we would get some data, but we wouldn’t be able to get a global view. It would be like watching television through a little hole,” says Sandrine Mathieu, Product Line Manager for Meteorology, Environment and Oceanography, at Thales Alenia Space. “Satellites give us a global view that progresses in time, showing how events are related and how fast they are evolving,” she adds. Some of the observation satellites orbiting around the Earth are purpose-designed for environmental monitoring. Satellites allow scientists and decision makers to better monitor the impact of climate change, and they can also be the only solution to monitor parts of the world where ground systems are not deployable

. Every day, their eyes stay focused on our planet, capturing images that provide invaluable data to help us respond when nature goes wild, as well as to understand climate change, make better use of natural resources and protect populations at risk. Creating a ‘digital twin’ of Earth For example, satellites were able to detect the impact that the intense bushfires in Australia at the end of 2019 had on air quality in the United States, 15,000 kilometres away. Another key purpose of satellites is the monitoring of oceans. Around 70% of the planet’s surface is covered by oceans, which have a crucial impact on climate, regulating heat, absorbing CO2 and providing food as well as economic sustenance to coastal communities. Monitoring the oceans from space means we can have a comprehensive picture of their health by checking their depth with millimetre accuracy thanks to radar technology, their temperature with thermal infra-red sensors, and their salinity and – last but not least – their colour through the eyes of optical sensors. Oceans are not always blue. Their hue depends on the concentration of phytoplankton and other particle matters that could indicate discharges or the presence of pollution. By keeping an eye on oceans, we can detect algae bloom, which have a deadly effect on marine wildlife. The new-generation satellites will offer greater capabilities. The next step in the study of the Earth from space will be a hyperspectral 2D sounding meteorology mission that will provide a 3D vision of the atmosphere, compared with the surface data we can gather today. This will provide a gigantic leap in the knowledge we can apply to air transport, as well as the study of typhoons and air quality. “The logical continuation is the creation of a ‘digital twin’ for the Earth, which will allow us to gather all sorts of environment parameters (biodiversity, agricultural ressources, water quality, water height, …) on the global surface planet and monitor them in real time. By observing and understanding interactions we will eventually be able to anticipate pollution, extreme events, harvests, forest fires, climate change impacts, etc ,” says Sandrine Mathieu. Providing technology that benefits the daily lives of people At Thales, we’re fully aware of the impact of global warming. For more than 40 years now, Thales Alenia Space engineers have leveraged their expertise to give the world’s scientists and decision-makers the means they need to acquire vital data for environmental monitoring, oceanography and meteorology. Thales Alenia Space has been at the forefront of European geostationary meteorology, as prime contractor for three generations of Meteosat weather satellites on behalf of the European Space Agency (ESA) and EUMETSAT, the European operational satellite agency for monitoring weather, climate and the environment. The company is also involved in major Sentinel missions, a key to Europe’s environmental monitoring efforts. Sentinel satellites are being built on behalf of ESA as part of the European Union’s Copernicus programme. Thales Alenia Space is a major partneronboard this very ambitious programme, which is designed to monitor land and ocean, vegetation, soil and coastal areas, and study sea-surface as well as the temperature and colour of sea and land. As a world leader in altimetry and a major partner onboard the most iconic international missions dedicated to oceanography, Thales Alenia Space is also working on the French-American oceanography satellite SWOT (Surface Water Ocean Topography), which will revolutionise modern oceanography by detecting ocean features with 10 times better resolution than current technologies. Thales, which aims to provide technology that benefits the daily lives of people around the world, is committed to fighting climate disruption. Observation of the Earth from space is crucial to defining and implementing responsible environmental policies as satellite missions ensure that the environment we live in – the air we breathe, the water where we bathe and the forests we walk in -- remains as clean as possible.

#### Climate change triggers sweeping death and population loss (AGW = anthropogenic global warming)

**Parncutt, 19** - Professor of Systematic Musicology at the University of Graz. Honours (Master's) degree in Physics from University of New England (UNE), Australia. Interdisciplinary PhD in psychology, music and physics from UNE (Richard, Edited by: Eric Brymer, Australian College of Applied Psychology, Australia Reviewed by: José Gutiérrez-Pérez, University of Granada, Spain; Robert Martin Rees, Scotland’s Rural College, United Kingdom, 10-16-2019, accessed on 6-28-2021, Frontiers in Psychology, "The Human Cost of Anthropogenic Global Warming: Semi-Quantitative Prediction and the 1,000-Tonne Rule", doi: 10.3389/fpsyg.2019.02323)ao **AGW = Anthropogenic Global Warming**

Today, about 30% of global population experiences deadly heat for over 20 days per year. By 2100, this will rise to 48% if GHG emissions are drastically reduced and 74% if they continue to grow (Mora et al., 2017). The combination of AGW and high population growth in developing African countries such as Equatorial Guinea, Omar, Niger, Uganda, Angola, and Congo will lead to unprecedented death rates due to poverty (hunger, disease, and violence) and massive population displacement. Africa’s population (currently 1.3 × 109) will rise to roughly 2.5 × 109 by 2050 and 4 × 109 by 21002. Between 2017 and 2050, 26 African countries may double their populations (United Nations, 2017b). Even without AGW, it will not be possible to produce and deliver sufficient food and fresh water (Godfray et al., 2010). AGW will exacerbate the crisis—even without considering population growth (McMichael et al., 2006, 2008). By 2100, the total death toll due to 2°C AGW may approach 10^9 in Africa alone. There will be severe climate impacts in the Middle East and Northern Africa, with mean temperature increases well above GMST and displacement of large human populations (Economist, 2018). Thomas et al. (2004) estimated that 15% of all species will be extinct by 2050 if AGW is limited to 1.5°C; 37% if limited to 2°C. Ecological dependencies may multiply the direct effects of environmental change on the collapse of planetary diversity by 10 (Strona and Bradshaw, 2018). Loss of biodiversity will make it impossible to feed a larger African population (Frison et al., 2011). Insect populations will be affected by a combination of AGW and insecticides (Boggs, 2016). Forty percent of the world’s insect species may go extinct in coming decades (Resnick, 2019; Sánchez-Bayo and Wyckhuys, 2019). In the past 50 years, bee pollinations have declined as demand for agricultural pollination has approximately tripled, triggering a pollination crisis that affects crop yields (Goulson et al., 2015). Extinction of bee species could lead to the extinction of plant species that depend on bees for pollination, leading to other animal, plant, and insect extinctions, which in turn affects insect-eating bird populations (Goulson, 2014). Biodiverse coral reefs will be degraded due to pollution, overfishing, and rising temperature and acidity of ocean waters (Hughes et al., 2017). Oceanic oxygen concentration is also falling (Poppick, 2019). Most reefs will be seriously threatened or irreversibly damaged by 2050 (Burke et al., 2011) and the rest may die by 2100. Sekerci and Petrovskii (2015) showed that “the oxygen production by marine phytoplankton can stop suddenly if the water temperature exceeds a certain critical value. Since the ocean plankton produces altogether more than one half of the total atmospheric oxygen, it would mean oxygen depletion not only in the water but also in the air. Should it happen, it would obviously kill most of life on Earth” (p. 2349). Soil will be degraded by chemical-heavy farming techniques and deforestation-induced erosion, reducing crop yields (Arsenault, 2014). “There is rapidly escalating competition between the demand for land functions that provide food, water, and energy, and those services that support and regulate all life cycles on Earth” (United Nations, 2017c, p. 8). Groundwater (Dalin et al., 2017) is the largest available store of global freshwater and 2 × 10^9 people rely on it. About 6% of global groundwater is readily available and can be replenished with a human lifespan (Gleeson et al., 2016). Where groundwater is depleted, recovery may take centuries or millennia (Cuthbert et al., 2019, p. 140). About 10% of global land is covered by glaciers, and 10^9 people depend on their meltwater (Qui, 2019). AGW will cause non-polar glacier volume to fall by 29–41% in 2100; “glaciers in Central Europe, low-latitude South America, Caucasus, North Asia, Western Canada, and US are projected to lose more than 80% of their volume by 2100” with “major implications for regional hydrology and water availability in the near future” (Radić et al., 2014). Clarke et al. (2015) predicted that by 2100 Western Canadian glaciers will shrink by 70% relative to 2005, affecting aquatic ecosystems, agriculture, forestry, and water quality. Iceland’s glaciers will shrink by 40% in 2100 and 100% in 2200 (Poore et al., 2000). Accelerated deglaciation in Greenland from 2003 to 2013 suggests a tipping point driven by changes in air temperature and solar radiation (Bevis et al., 2019). Pathogens such as anthrax may emerge from melting permafrost (Revich and Podolnaya, 2011; Legendre et al., 2015) and cause regional or global pandemics (Wu et al., 2016). Humans have little immune resistant to zoonoses—diseases transmitted between human and non-human animals, such as ebola and salmonellosis. In the 14th century, bubonic plague (spread by fleas or body fluids from plague-infected animals) killed 25–40% of European children and adults (Galvani and Slatkin, 2003). 2°C AGW will trigger conflicts over natural resources (Barnett and Adger, 2007). Political destabilization could lead to use of nuclear weapons, causing radioactive fallout and ozone depletion (Mills et al., 2008). In a zeroth-order estimate, one or more of these points could alone cause 10^7 deaths per year for a century—a total of 10^9 deaths each. If that is true, a worst-case estimate of 3 × 10^9 for the worst-case AGW death toll may be realistic. That would correspond to roughly 30% of future world population, which will reach 9.8 × 10^9 in 2050 and 11.2 × 109 in 2100 (or between 8 × 109 and 15 × 109; United Nations (2017a). Given the high degree of uncertainty, a more precise estimate is hardly realistic.

### AT: definitions

### AT: anticolonization

#### Scenario 1 – disease

#### Space colonization is key to human survival

**David 15** (Javier E. David, CNBC weekend editor, “Why Humanity's Survival May Depend on Colonizing Mars”, CNBC, 10/17/15, <https://www.nbcnews.com/tech/innovation/why-humanitys-survival-may-depend-colonizing-mars-n446196>) // el

After decades of space exploration and countless movies on the subject, why exactly does Mars continue to inspire such high levels of cultural and scientific fascination? Both the red planet and NASA are coasting on a wave of newfound popularity, taking center stage in big-budget Hollywood productions. Whether by coincidence or design, the favorable treatment of NASA by Tinseltown comes at a time when the space agency recently discovered evidence for flowing water on Mars, and last week openly declared colonizing the planet within the next 20 years "an achievable goal." And at least a few scientists think the survival of humanity may hinge on finding a new, hospitable planet to colonize. Just a few years ago, NASA critics and even some supporters were openly questioning whether the Mars science laboratory was worth its $2.5 billion price tag. Fast forward a few years, and the space agency is moving full speed toward establishing a human presence on the planet — a quest that looks less and less quixotic by the day. "Mars is obviously the logical next place to expand our capabilities and getting Earth crews there," Edwin "Buzz" Aldrin told CNBC in a recent interview. The famed astronaut and second man to walk on the moon's surface said sending humans to the planet would be an accomplishment "that's unparalleled in humanity." In a document outlining its rationale for sending humans to the far-flung planet — which lies 140 million miles from the Earth — NASA invoked the 1969 Apollo voyage, adding that unlike the moon, a mission to Mars would involve "going to stay." Mars' atmosphere is noted for its thin, carbon dioxide-filled air and ferocious dust storms that last for months. But given the right conditions, some think Mars could eventually be capable of sustaining humans. "We need to keep public interest stimulated and demonstrate to our leaders ... this is a most historical opportunity," Aldrin said, speaking from a conference in Israel. He added the human race was in a prime position to become "pilgrims in setting up permanence on Mars." In fact, the prospect of humans pioneering on Mars is gradually becoming more and more of a reality — and in some ways may be a necessity, a top-ranking NASA scientist told CNBC recently. "If the human species is going to survive, is it going to survive solely on Earth or not," asked Jim Greene, NASA's director of planetary science. "The appeal has been that as we explore, the next frontier beyond our atmosphere is Mars. That captures a lot of imagination in science, but also in science fiction." Yet Greene also underscored the inherent dangers of outer space, and the imperative to discover other systems capable of sustaining human life. He characterized Earth as existing in "a dangerous part of the solar system" that runs the outside risk of being hit by a "planet-killing" asteroid. Although it may sound like a plot from a science fiction movie, Greene explained that NASA has identified 876 out of more than 12,000 near-Earth objects that the agency is "really monitoring carefully." "In the last 500 million years of the Earth's history there have been five mass extinctions of species. The last one was the end of the dinosaurs," Greene said, referencing the event that scientists surmise brought about the extinction of dinosaurs more than 65 million years ago. Within the known range of potential "planet killers" — asteroids that are at least 2 km in size — that the space agency monitors, "there are more than 150 that we're really watching carefully," Greene said. These "potentially hazardous asteroids" will come within 5 million miles of the planet over the next 100 years. “They cross our orbit frequently, and we know we're going to get hit again," Greene said. "It’s not a matter of if, but when." Within the last several decades, there have been minor brushes with asteroids, but none that have the potential to endanger human life on a large scale — at least not yet. Recently, NASA disclosed it was monitoring a 480-meter asteroid that could collide with the Earth sometime within the next four decades. British astronomers have been even more stark in speaking of the likelihood that a space rock of large enough size could create pandemonium around the world. Asteroids "cross our orbit frequently, and we know we're going to get hit again," Greene said, underscoring that factors such as trajectory and conditions in space can determine whether asteroids hit the earth or pass it by. However, "it's not a matter of if, but when. This planet won't have a planet killer hit it for many hundreds of years, but it will happen," he added. The panoply of risks makes it important to seek out viable alternatives to ensure humanity's survival. Likening the idea of an extraterrestrial colony to a computer's external hard drive, Greene told CNBC that "If we're going to live as a species, we're going to have to 'back up' in other places ... and that place is Mars."

#### Disease doesn’t cause extinction

Adalja 16 [Amesh Adalja, infectious disease physician at the University of Pittsburgh] “Why Hasn't Disease Wiped out the Human Race?” June 17, 2016 (http://www.theatlantic.com/health/archive/2016/06/infectious-diseases-extinction/487514/) - MZhu

But when people ask me if I’m worried about infectious diseases, they’re often not asking about the threat to human lives; they’re asking about the threat to human life. With each outbreak of a headline-grabbing emerging infectious disease comes a fear of extinction itself. The fear envisions a large proportion of humans succumbing to infection, leaving no survivors or so few that the species can’t be sustained. I’m not afraid of this apocalyptic scenario, but I do understand the impulse. Worry about the end is a quintessentially human trait. Thankfully, so is our resilience. For most of mankind’s history, infectious diseases were the existential threat to humanity—and for good reason. They were quite successful at killing people: The 6th century’s Plague of Justinian knocked out an estimated 17 percent of the world’s population; the 14th century Black Death decimated a third of Europe; the 1918 influenza pandemic killed 5 percent of the world; malaria is estimated to have killed half of all humans who have ever lived. Any yet, of course, humanity continued to flourish. Our species’ recent explosion in lifespan is almost exclusively the result of the control of infectious diseases through sanitation, vaccination, and antimicrobial therapies. Only in the modern era, in which many infectious diseases have been tamed in the industrial world, do people have the luxury of death from cancer, heart disease, or stroke in the 8th decade of life. Childhoods are free from watching siblings and friends die from outbreaks of typhoid, scarlet fever, smallpox, measles, and the like. So what would it take for a disease to wipe out humanity now? In Michael Crichton’s The Andromeda Strain, the canonical book in the disease-outbreak genre, an alien microbe threatens the human race with extinction, and humanity’s best minds are marshaled to combat the enemy organism. Fortunately, outside of fiction, there’s no reason to expect alien pathogens to wage war on the human race any time soon, and my analysis suggests that any real-life domestic microbe reaching an extinction level of threat probably is just as unlikely. Any apocalyptic pathogen would need to possess a very special combination of two attributes. First, it would have to be so unfamiliar that no existing therapy or vaccine could be applied to it. Second, it would need to have a high and surreptitious transmissibility before symptoms occur. The first is essential because any microbe from a known class of pathogens would, by definition, have family members that could serve as models for containment and countermeasures. The second would allow the hypothetical disease to spread without being detected by even the most astute clinicians. The three infectious diseases most likely to be considered extinction-level threats in the world today—influenza, HIV, and Ebola—don’t meet these two requirements. Influenza, for instance, despite its well-established ability to kill on a large scale, its contagiousness, and its unrivaled ability to shift and drift away from our vaccines, is still what I would call a “known unknown.” While there are many mysteries about how new flu strains emerge, from at least the time of Hippocrates, humans have been attuned to its risk. And in the modern era, a full-fledged industry of influenza preparedness exists, with effective vaccine strategies and antiviral therapies. HIV, which has killed 39 million people over several decades, is similarly limited due to several factors. Most importantly, HIV’s dependency on blood and body fluid for transmission (similar to Ebola) requires intimate human-to-human contact, which limits contagion. Highly potent antiviral therapy allows most people to live normally with the disease, and a substantial group of the population has genetic mutations that render them impervious to infection in the first place. Lastly, simple prevention strategies such as needle exchange for injection drug users and barrier contraceptives—when available—can curtail transmission risk. Ebola, for many of the same reasons as HIV as well as several others, also falls short of the mark. This is especially due to the fact that it spreads almost exclusively through people with easily recognizable symptoms, plus the taming of its once unfathomable 90 percent mortality rate by simple supportive care. Beyond those three, every other known disease falls short of what seems required to wipe out humans—which is, of course, why we’re still here. And it’s not that diseases are ineffective. On the contrary, diseases’ failure to knock us out is a testament to just how resilient humans are. Part of our evolutionary heritage is our immune system, one of the most complex on the planet, even without the benefit of vaccines or the helping hand of antimicrobial drugs. This system, when viewed at a species level, can adapt to almost any enemy imaginable. Coupled to genetic variations amongst humans—which open up the possibility for a range of advantages, from imperviousness to infection to a tendency for mild symptoms—this adaptability ensures that almost any infectious disease onslaught will leave a large proportion of the population alive to rebuild, in contrast to the fictional Hollywood versions. While the immune system’s role can never be understated, an even more powerful protector is the faculty of consciousness. Humans are not the most prolific, quickly evolving, or strongest organisms on the planet, but as Aristotle identified, humans are the rational animals—and it is this fundamental distinguishing characteristic that allows humans to form abstractions, think in principles, and plan long-range. These capacities, in turn, allow humans to modify, alter, and improve themselves and their environments. Consciousness equips us, at an individual and a species level, to make nature safe for the species through such technological marvels as antibiotics, antivirals, vaccines, and sanitation. When humans began to focus their minds on the problems posed by infectious disease, human life ceased being nasty, brutish, and short. In many ways, human consciousness became infectious diseases’ worthiest adversary.

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