# Feedback

What could the 2NR do better?

* A little more time preempting anything the 2ar could’ve said with respect to the perm
* Cap was a bad 2nr – sided with the aff about there not being a link to a cap good arg – no internal link
  + IF I read “the plan crashes the economy” then would there have been an internal link there

# 1NC

### T

#### Interpretation – the affirmative may not specify a subset of medicines

#### Violation – they only defend COVID medicines

#### Standards:

#### Limits – There’s an infinite number of medicines – hundreds of vaccines (Influenza, Coronavirus, Diptheria, Yellow Fever, etc.) and thousands of pharmaceutical drugs (Metformin, Lisinopril, Atorvastatin, and many more) – the negative could spec AND choose combinations – that’s supercharged by the fact that they can also spec countries. Kills neg burdens – it’s impossible for me to research every possible combination of medicines. Functional limits don’t check – each individual weapon has implications and articles as to why it is bad

#### Topicality should be a voting issue evaluated through competing interpretations—reasonability invites arbitrary judge intervention that takes the debate out of the hands of the debaters. Pre-round prep has already been skewed which means the only remedy is to drop the debater.

### FW

#### Extinction comes first!

Pummer 15 [Theron, Junior Research Fellow in Philosophy at St. Anne's College, University of Oxford. “Moral Agreement on Saving the World” Practical Ethics, University of Oxford. May 18, 2015] AT

There appears to be lot of disagreement in moral philosophy. Whether these many apparent disagreements are deep and irresolvable, I believe there is at least one thing it is reasonable to agree on right now, whatever general moral view we adopt: that it is very important to reduce the risk that all intelligent beings on this planet are eliminated by an enormous catastrophe, such as a nuclear war. How we might in fact try to reduce such existential risks is discussed elsewhere. My claim here is only that we – whether we’re consequentialists, deontologists, or virtue ethicists – should all agree that we should try to save the world. According to consequentialism, we should maximize the good, where this is taken to be the goodness, from an impartial perspective, of outcomes. Clearly one thing that makes an outcome good is that the people in it are doing well. There is little disagreement here. If the happiness or well-being of possible future people is just as important as that of people who already exist, and if they would have good lives, it is not hard to see how reducing existential risk is easily the most important thing in the whole world. This is for the familiar reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. There are so many possible future people that reducing existential risk is arguably the most important thing in the world, even if the well-being of these possible people were given only 0.001% as much weight as that of existing people. Even on a wholly person-affecting view – according to which there’s nothing (apart from effects on existing people) to be said in favor of creating happy people – the case for reducing existential risk is very strong. As noted in this seminal paper, this case is strengthened by the fact that there’s a good chance that many existing people will, with the aid of life-extension technology, live very long and very high quality lives. You might think what I have just argued applies to consequentialists only. There is a tendency to assume that, if an argument appeals to consequentialist considerations (the goodness of outcomes), it is irrelevant to non-consequentialists. But that is a huge mistake. Non-consequentialism is the view that there’s more that determines rightness than the goodness of consequences or outcomes; it is not the view that the latter don’t matter. Even John Rawls wrote, “All ethical doctrines worth our attention take consequences into account in judging rightness. One which did not would simply be irrational, crazy.” Minimally plausible versions of deontology and virtue ethics must be concerned in part with promoting the good, from an impartial point of view. They’d thus imply very strong reasons to reduce existential risk, at least when this doesn’t significantly involve doing harm to others or damaging one’s character. What’s even more surprising, perhaps, is that even if our own good (or that of those near and dear to us) has much greater weight than goodness from the impartial “point of view of the universe,” indeed even if the latter is entirely morally irrelevant, we may nonetheless have very strong reasons to reduce existential risk. Even egoism, the view that each agent should maximize her own good, might imply strong reasons to reduce existential risk. It will depend, among other things, on what one’s own good consists in. If well-being consisted in pleasure only, it is somewhat harder to argue that egoism would imply strong reasons to reduce existential risk – perhaps we could argue that one would maximize her expected hedonic well-being by funding life extension technology or by having herself cryogenically frozen at the time of her bodily death as well as giving money to reduce existential risk (so that there is a world for her to live in!). I am not sure, however, how strong the reasons to do this would be. But views which imply that, if I don’t care about other people, I have no or very little reason to help them are not even minimally plausible views (in addition to hedonistic egoism, I here have in mind views that imply that one has no reason to perform an act unless one actually desires to do that act). To be minimally plausible, egoism will need to be paired with a more sophisticated account of well-being. To see this, it is enough to consider, as Plato did, the possibility of a ring of invisibility – suppose that, while wearing it, Ayn could derive some pleasure by helping the poor, but instead could derive just a bit more by severely harming them. Hedonistic egoism would absurdly imply she should do the latter. To avoid this implication, egoists would need to build something like the meaningfulness of a life into well-being, in some robust way, where this would to a significant extent be a function of other-regarding concerns (see chapter 12 of this classic intro to ethics). But once these elements are included, we can (roughly, as above) argue that this sort of egoism will imply strong reasons to reduce existential risk. Add to all of this Samuel Scheffler’s recent intriguing arguments (quick podcast version available here) that most of what makes our lives go well would be undermined if there were no future generations of intelligent persons. On his view, my life would contain vastly less well-being if (say) a year after my death the world came to an end. So obviously if Scheffler were right I’d have very strong reason to reduce existential risk. We should also take into account moral uncertainty. What is it reasonable for one to do, when one is uncertain not (only) about the empirical facts, but also about the moral facts? I’ve just argued that there’s agreement among minimally plausible ethical views that we have strong reason to reduce existential risk – not only consequentialists, but also deontologists, virtue ethicists, and sophisticated egoists should agree. But even those (hedonistic egoists) who disagree should have a significant level of confidence that they are mistaken, and that one of the above views is correct. Even if they were 90% sure that their view is the correct one (and 10% sure that one of these other ones is correct), they would have pretty strong reason, from the standpoint of moral uncertainty, to reduce existential risk. Perhaps most disturbingly still, even if we are only 1% sure that the well-being of possible future people matters, it is at least arguable that, from the standpoint of moral uncertainty, reducing existential risk is the most important thing in the world. Again, this is largely for the reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. (For more on this and other related issues, see this excellent dissertation). Of course, it is uncertain whether these untold trillions would, in general, have good lives. It’s possible they’ll be miserable. It is enough for my claim that there is moral agreement in the relevant sense if, at least given certain empirical claims about what future lives would most likely be like, all minimally plausible moral views would converge on the conclusion that we should try to save the world. While there are some non-crazy views that place significantly greater moral weight on avoiding suffering than on promoting happiness, for reasons others have offered (and for independent reasons I won’t get into here unless requested to), they nonetheless seem to be fairly implausible views. And even if things did not go well for our ancestors, I am optimistic that they will overall go fantastically well for our descendants, if we allow them to. I suspect that most of us alive today – at least those of us not suffering from extreme illness or poverty – have lives that are well worth living, and that things will continue to improve. Derek Parfit, whose work has emphasized future generations as well as agreement in ethics, described our situation clearly and accurately: “We live during the hinge of history. Given the scientific and technological discoveries of the last two centuries, the world has never changed as fast. We shall soon have even greater powers to transform, not only our surroundings, but ourselves and our successors. If we act wisely in the next few centuries, humanity will survive its most dangerous and decisive period. Our descendants could, if necessary, go elsewhere, spreading through this galaxy…. Our descendants might, I believe, make the further future very good. But that good future may also depend in part on us. If our selfish recklessness ends human history, we would be acting very wrongly.” (From chapter 36 of On What Matters)

### CP

#### CP Text: The member nations of the WTO should grant a TRIPS waiver for all COVID vaccines except those that use mRNA technology

#### The WHO guarantees the plan mostly increases mRNA vaccine production

WHO 4/21—WHO, 4-21-2021, “Establishment of a COVID-19 mRNA vaccine technology transfer hub to scale up global manufacturing,” <https://www.who.int/news-room/articles-detail/establishment-of-a-covid-19-mrna-vaccine-technology-transfer-hub-to-scale-up-global-manufacturing>. (AG DebateDrills)

WHO and its partners are seeking to expand the capacity of low- and middle-income countries (LMICs) to produce COVID-19 vaccines and scale up manufacturing to increase global access to these critical tools to bring the pandemic under control.

WHO will facilitate the establishment of one (or more, as appropriate) technology transfer hub(s) that will use a hub and spoke model (REF) to transfer a comprehensive technology package and provide appropriate training to interested manufacturers in LMICs. This initiative will initially prioritize the mRNA-vaccine technology2 but could expand to other technologies in the future.

The intention is for these hubs to enable the establishment of production process at an industrial or semi-industrial level permitting training and provision of all necessary standard operating procedures for production and quality control. It is essential that the technology used is either free of intellectual property constraints in LMICs, or that such rights are made available to the technology hub and the future recipients of the technology through non-exclusive licenses to produce, export and distribute the COVID-19 vaccine in LMICs, including through the COVAX facility. Preference will be given to applicants who have already generated clinical data in humans, as such clinical data will contribute to accelerated approval of the vaccines in LMICs.

#### Limiting waiver to non-mRNA guarantees use of those vaccines—they’re more effective at fighting COVID in developing countries, turning case. 3 warrants:

#### First logistics, mRNA cooling requirements and cost make them far harder to distribute in developing countries with inadequate infrastructure

Mahase 20-- Mahase, Elisabeth. "Covid-19: What do we know about the late stage vaccine candidates?." British Medical Journal. (2020). (AG DebateDrills)

Pfizer and BioNTech’s BNT162b2 is the first vaccine candidate to be submitted to the US Food and Drug Administration (FDA) for emergency use authorisation.2 The submission was filed on 20 November, after the conclusion of a phase III trial. The results, released by press release, evaluated 170 confirmed cases of covid-19 and reported that the vaccine was 95% effective 28 days after the first dose. Nine out of 10 severe covid-19 cases in the trial were in the placebo group. Pfizer said the vaccine could be available to high risk populations in the US by the end of December 2020. The UK government has agreed a deal for 40 million doses (enough for 20 million people) and expects to have 10 million doses by the end of 2020. Meanwhile, the EU has secured a deal for 200 million doses, with an optional 100 million extra doses. Globally, 50 million doses are expected in 2020 and up to 1.3 billion doses by the end of 2021. The companies have started submission processes in Australia, Canada, Europe, and Japan. The vaccine is estimated to cost around £15 per dose—much higher than the Oxford-AstraZeneca vaccine. Concerns have also been raised over logistics, as the vaccine must be stored at −70°C. Moderna and US National Institutes of Health vaccine The mRNA-1273 vaccine, developed by US biotech company Moderna in partnership with the US National Institutes of Health (NIH), is 94.5% effective according to the interim findings of US based phase III trial results.3 The analysis was based on 95 covid-19 cases, of which 90 (11 severe) were observed in the placebo group and five were reported in the vaccine group. The trial enrolled more than 30 000 US participants, including 7000 aged over 65 and 5000 under 65 with high risk chronic diseases. More than one third (37%, 11 000) of the trial participants were from “communities of colour.” Of the 95 cases, 15 were adults over 65, and 20 identified as being from diverse communities (12 Hispanic, four black, three Asian American, and one multiracial). Moderna intends to submit the interim safety and efficacy data to the FDA for emergency use authorisation soon, following a final analysis of 151 cases and a median follow-up of more than two months. The US has agreed a deal for 100 million doses, while the UK government has secured five million doses of the vaccine candidate. If approved by the medicines regulator, the vaccine could be delivered to the UK in spring 2021. Moderna’s vaccine can be stored in a household fridge for 30 days, at room temperature for up to 12 hours, and at −20°C for up to six months. However, compared with the Oxford-AstraZeneca and Pfizer vaccines, Moderna’s candidate is much more expensive at approximately £25 per dose.

#### Second, the requirement for 2 doses means vaccination campaign takes much longer. J&J does not have this requirement

#### Third, developing countries already have production capacity for traditional vaccines, mRNA development shifts resources and takes time to get off the ground

Iacobucci 21-- Iacobucci, Gareth. “Covid-19: How will a waiver on vaccine patents affect global supply?,” BMJ : British Medical Journal (Online); London Vol. 373, (May 10, 2021). DOI:10.1136/bmj.n1182. (AG DebateDrills)

“You simply cannot achieve this kind of capacity expansion by waiving patents and hoping that hitherto unknown factories around the world will turn their hand to the complex process of vaccine manufacture,” she said. “A waiver risks diverting raw materials and supplies away from well established, effective supply chains to less efficient manufacturing sites where productivity and quality may be an issue. It opens the door to counterfeit vaccines entering the supply chain around the world.” Javier Guzman, technical director of the Medicines, Technologies, and Pharmaceutical Services programme at Management Sciences for Health, a global non-profit organisation, told The BMJ that some middle income countries did have the capabilities to make vaccines and some were already producing covid vaccines. He cited the voluntary licensing agreements made by AstraZeneca with Indian and Brazilian manufacturers. But he added, “It is important to distinguish between viral vectors (such as the AstraZeneca vaccine) and mRNA vaccines (Pfizer and Moderna) and between producing the liquid vaccine solution (the active ingredient) and filling and capping sterile vials (known as “fill-and-finish”). More manufacturers in low and middle income countries are in the position to manufacture viral vectors and/or contribute with the fill-and-finish stage of the process.”

### Case

### AT Impact

#### No waiver is needed – herd immunity can be achieved by the end of the year.

LSS 21 The Launch and Scale Speedometer is led by the [Duke Global Health Innovation Center](http://www.dukeghic.org/), with support from the Bill & Melinda Gates Foundation, “Vaccines Manufacturing”, 2021, <https://launchandscalefaster.org/covid-19/vaccinemanufacturing> | MU

VACCINE MAKERS PROJECT A GLOBAL TOTAL OF 12 BILLION DOSES OF COVID-19 VACCINE IN 2021 Our analysis of 2021 projections from Covid-19 vaccine makers indicates that more than 12 billion doses could be produced this year. It is important to remember that this total is a sum of projections from vaccine developers and may include optimistic assumptions. Assuming the market is primarily 2-dose vaccines (Janssen and CanSino are the only 1-dose vaccines currently on the market), about 11 billion doses are needed to vaccinate 70 percent of the world’s population. This is frequently seen as the threshold to approach herd immunity, the level of vaccination coverage that limits spread and protects those who are unable to be vaccinated from infection. If manufacturers are able to reach their goal of more than 12 billion doses this year and if those doses were purchased and distributed equitably across the world’s population, we could meet much of the world’s needs in 2021. (It is worth noting that those are both big ifs.)

Global needs can change, however. For example, the emergence and spread of new variants may mean that we need a new generation of vaccines before the end of 2021. We also do not yet know how long immunity from vaccines will last and we may need regular booster shots to maintain immunity and to target new variants. No vaccines are yet approved for use in children under 16 years of age, but several are being tested in children now. The approval of one or more vaccines for children could shift the demand and supply landscape again. Some countries may also choose to purchase and maintain surplus vaccine doses beyond their immediate needs in order to manage future risks, diminishing the immediate supply for other countries.

#### Warming doesn’t cause extinction

Nordhaus 20 Ted Nordhaus, an American author, environmental policy expert, and the director of research at The Breakthrough Institute, citing new climate change forecasts. [Ignore the Fake Climate Debate, 1-23-2020, https://www.wsj.com/articles/ignore-the-fake-climate-debate-11579795816]//BPS

Beyond the headlines and social media, where Greta Thunberg, Donald Trump and the online armies of climate “alarmists” and “deniers” do battle, there is a real climate debate bubbling along in scientific journals, conferences and, occasionally, even in the halls of Congress. It gets a lot less attention than the boisterous and fake debate that dominates our public discourse, but it is much more relevant to how the world might actually address the problem. In the real climate debate, no one denies the relationship between human emissions of greenhouse gases and a warming climate. Instead, the disagreement comes down to different views of climate risk in the face of multiple, cascading uncertainties. On one side of the debate are optimists, who believe that, with improving technology and greater affluence, our societies will prove quite adaptable to a changing climate. On the other side are pessimists, who are more concerned about the risks associated with rapid, large-scale and poorly understood transformations of the climate system. But most pessimists do not believe that runaway climate change or a hothouse earth are plausible scenarios, much less that human extinction is imminent. And most optimists recognize a need for policies to address climate change, even if they don’t support the radical measures that Ms. Thunberg and others have demanded. In the fake climate debate, both sides agree that economic growth and reduced emissions vary inversely; it’s a zero-sum game. In the real debate, the relationship is much more complicated. Long-term economic growth is associated with both rising per capita energy consumption and slower population growth. For this reason, as the world continues to get richer, higher per capita energy consumption is likely to be offset by a lower population. A richer world will also likely be more technologically advanced, which means that energy consumption should be less carbon-intensive than it would be in a poorer, less technologically advanced future. In fact, a number of the high-emissions scenarios produced by the United Nations Intergovernmental Panel on Climate Change involve futures in which the world is relatively poor and populous and less technologically advanced. Affluent, developed societies are also much better equipped to respond to climate extremes and natural disasters. That’s why natural disasters kill and displace many more people in poor societies than in rich ones. It’s not just seawalls and flood channels that make us resilient; it’s air conditioning and refrigeration, modern transportation and communications networks, early warning systems, first responders and public health bureaucracies. New research published in the journal Global Environmental Change finds that global economic growth over the last decade has reduced climate mortality by a factor of five, with the greatest benefits documented in the poorest nations. In low-lying Bangladesh, 300,000 people died in Cyclone Bhola in 1970, when 80% of the population lived in extreme poverty. In 2019, with less than 20% of the population living in extreme poverty, Cyclone Fani killed just five people. “Poor nations are most vulnerable to a changing climate. The fastest way to reduce that vulnerability is through economic development.” So while it is true that poor nations are most vulnerable to a changing climate, it is also true that the fastest way to reduce that vulnerability is through economic development, which requires infrastructure and industrialization. Those activities, in turn, require cement, steel, process heat and chemical inputs, all of which are impossible to produce today without fossil fuels. For this and other reasons, the world is unlikely to cut emissions fast enough to stabilize global temperatures at less than 2 degrees above pre-industrial levels, the long-standing international target, much less 1.5 degrees, as many activists now demand. But recent forecasts also suggest that many of the worst-case climate scenarios produced in the last decade, which assumed unbounded economic growth and fossil-fuel development, are also very unlikely. There is still substantial uncertainty about how sensitive global temperatures will be to higher emissions over the long-term. But the best estimates now suggest that the world is on track for 3 degrees of warming by the end of this century, not 4 or 5 degrees as was once feared. That is due in part to slower economic growth in the wake of the global financial crisis, but also to decades of technology policy and energy-modernization efforts. “We have better and cleaner technologies available today because policy-makers in the U.S. and elsewhere set out to develop those technologies.” The energy intensity of the global economy continues to fall. Lower-carbon natural gas has displaced coal as the primary source of new fossil energy. The falling cost of wind and solar energy has begun to have an effect on the growth of fossil fuels. Even nuclear energy has made a modest comeback in Asia.

#### Even completely unchecked deforestation takes 200 years and won’t cause extinction

Hannah **Voak 16**, Assistant Ecologist, Nurture Ecology Ltd., 4/22/16, “A world without trees,” <http://www.scienceinschool.org/content/world-without-trees>

There are approximately 3.04 trillion trees on planet Earth (Crowther et al 15), covering 31% of the world’s land surfacew1. Today, for Earth day, we’re taking a look at trees. Around 15 billion trees are cut down each year. So, hypothetically speaking, it would take just over 200 years for the world’s forests to completely disappear. While this scenario is unlikely, what would be the consequences of a tree-free planet? Let’s start with perhaps the most obvious difference – oxygen concentration. A lack of oxygen? Oxygen makes up roughly 21% of the Earth’s atmosphere, but you probably know that already. What you might be surprised to find out, however, is that only half of this oxygen is produced through photosynthesis in trees and other plants on land. The other half is produced in oceans, by microscopic marine organisms called phytoplankton. The environment would not be devoid of oxygen if all trees were lost but the oxygen level would be lower. Would it be sufficient for humans to survive? In one year, a mature leafy tree produces as much oxygen as ten people breathe. If phytoplankton provides us with half our required oxygen, at current population levels we could survive on Earth for at least 4000 years before the oxygen store ran empty. However, that’s not considering a number of other factors: increasing population size, for example, would reduce the amount of oxygen available, whilst phytoplankton blooms due to an abundance of carbon dioxide could increase oxygen levels. Suffocating smog Whilst there may be enough oxygen for humans to survive on Earth, at least to begin with, the air we breathe could still be responsible for our demise. Like giant filters, trees help to cut down on pollution levels. Leaves intercept airborne particles and ozone, carbon monoxide, sulfur dioxide and other greenhouse gases are absorbed through the leaves stomata. In 2012, outdoor air pollution was estimated to cause 3.7 million premature deaths worldwidew2. Imagine the impact removing these environmental sieves would have on humankind. Air-pollution masks would become a necessity and bottled ‘clean air’ could come at a premium. Full of hot air? Armed with pollution masks, would the climate and temperature still be suitable for us? One important consideration is carbon dioxide. In one year, an acre of mature trees soaks up the same amount of carbon dioxide that we produce by driving the average car 26 000 miles. Since human activities like this increase the normal level of carbon dioxide in the atmosphere, cutting down trees would tip the balance even further, not to mention the enormous amount of stored carbon that would be released from doing so. Deforestation is already responsible for up to 15% of global greenhouse gas emissions and you might think that an overwhelming increase in carbon dioxide would result in a much warmer planet. However, the relationship between trees and global temperature is much more complicated. Energy and water fluxes between trees and the atmosphere also play a role and a tree’s colour, for example, can affect the amount of the Sun’s energy that is absorbed or reflected. Studies have shown that Europe’s trees have actually caused a slight increase in regional temperatures since 1750w3, while transpiration from plants in tropical forests cools the surface temperature. Therefore, whether the temperature becomes too hot to handle could depend on many factors, although a recent study concluded that reducing forest size increases average air surface temperatures in all climate zones (Alkama & Cescatti 16).

### AT FW

#### They Say Santos

#### 1-- No Collapse back onto ourselves -- if we win cap is sustainable etc. -- force them to win a particular indict of our scenarious

#### 2-- No Not reproducing the squo -- the CP fiats a different world and cap is revolutionizing tehcnology to further man kind –

#### 3-- You’ve double turned yourself – the cap adv has an extinction impact

#### 4—use probability x magnitude – solves bests

#### 5-- Their totalizing depiction of racial capitalism as requiring suicide produces a heroic drive for total revolution that obscurees “as existing” progress

Shulman, PhD, 17

(George, PoliSci@NYU, Critical Exchange Afro pessimism, Contemporary political theory)

For on the one hand, it seems to me that ‘‘social death’’ is totalized as the truth that must be faced without consolation, while on the other hand, the only valid response is depicted as revolutionary (perhaps violent) refusal. We are driven toward helplessness and despair by an annihilating structure that seems impossible to change, but also, if we ask, what can be done, we receive images of revolutionary suicide. The systematic character of critique offers a clarity that is appealing; we also may be tempted by the appearance of heroic radicalism – and by an unavowed solace we may derive from the form of ‘‘election’’ it offers. But we may be better served by questioning the either-or structure of exceptionality, which juxtaposes social death in/as the ordinary to metaphors of radical refusal. By that structure, Schmitt distinguished ordinary existence as deadening repetition, and miracle as the decision to take exception to it; for Wilderson and Sexton ‘‘life’’ thus seems to require the decisive, unequivocal ‘‘event’’ of overcoming an ordinary life ruled – indeed emptied out, negated, or literally killed – by inescapably gripping social death. But what kind of life or politics is this? Might the ‘‘fact’’ or ‘‘lived experience’’ of blackness as social death be metabolized, transfigured, resisted, or dramatized in other ways? Rather than radically juxtapose awful truth and demeaned consolation, could we rework the relationship of critique and repair? Or is the impossibility of repair in its usual senses – because only a revolution would be truly reparative – the necessary assumption for rightly seeing the conditions of black agency? Rather than respond to their critique by asking, what radical action could possibly suffice to change this world, could we ask instead, what is already being done?

### Cap Good

#### Growth is sustainable, physical limits aren’t absolute, AND resource use is declining now---degrowth unleashes global disaster

Bailey 18 [Ronald; February 16; B.A. in Economics from the University of Virginia, member of the Society of Environmental Journalists and the American Society for Bioethics and Humanities, citing a compilation of interdisciplinary research; Reason, “Is Degrowth the Only Way to Save the World?” https://reason.com/2018/02/16/is-degrowth-the-only-way-to-save-the-wor; RP]

Unless us folks in rich countries drastically reduce our material living standards and distribute most of what we have to people living in poor countries, the world will come to an end. Or at least that's the stark conclusion of a study published earlier this month in the journal Nature Sustainability. The researchers who wrote it, led by the Leeds University ecological economist Dan O'Neill, think the way to prevent the apocalypse is "degrowth." Vice, pestilence, war, and "gigantic inevitable famine" were the planetary boundaries set on human population by the 18th-century economist Robert Thomas Malthus. The new study gussies up old-fashioned Malthusianism by devising a set of seven biophysical indicators of national environmental pressure, which they then link to 11 indicators of social outcomes. The aim of the exercise is to concoct a "safe and just space" for humanity. Using data from 2011, the researchers calculate that the annual per capita boundaries for the world's 7 billion people consist of the emission of 1.6 tons of carbon dioxide per year and the annual consumption of 0.9 kilograms of phosphorus, 8.9 kilograms of nitrogen, 574 cubic meters of water, 2.6 tons of biomass (crops and wood), plus the ecological services of 1.7 hectares of land and 7.2 tons of material per person. On the social side, meanwhile, the researchers say that life satisfaction in each country should exceed 6.5 on the 10-point Cantril scale, that healthy life expectancy should average at least 65 years, and that nutrition should be over 2,700 calories per day. At least 95 percent of each country's citizens must have access to good sanitation, earn more than $1.90 per day, and pass through secondary school. Ninety percent of citizens must have friends and family they can depend on. The threshold for democratic quality must exceed 0.8 on an index scale stretching from -1 to +1, while the threshold for equality is set at no higher than 70 on a Gini Index where 0 represents perfect equality and 100 implies perfect inequality. They set the threshold for percent of labor force employed at 94 percent. So how does the U.S. do with regard to their biophysical boundaries and social outcomes measures? We Americans transgress all seven of the biophysical boundaries. Carbon dioxide emissions stand at 21.2 tons per person; we each use an average of 7 kilograms of phosphorus, 59.1 kilograms of nitrogen, 611 cubic meters of water, and 3.7 tons of biomass; we rely on the ecological services of 6.8 hectares of land and 27.2 tons of material. Although the researchers urge us to move "beyond the pursuit of GDP growth to embrace new measures of progress," it is worth noting that U.S. GDP is $59,609 per capita. On the other hand, those transgressions have provided a pretty good life for Americans. For example, life satisfaction is 7.1; healthy life expectancy is 69.7 years; and democratic quality stands at 0.8 points. The only two social indicators we just missed on were employment (91 percent) and secondary education (94.7 percent). On the other hand, our hemisphere is home to one paragon of sustainability—Haiti. Haitians breach none of the researchers' biophysical boundaries. But the Caribbean country performs abysmally on all 11 social indicators. Life satisfaction scores at 4.8; healthy life expectancy is 52.3 years; and Haitians average 2,105 calories per day. The country tallies -0.9 on the democratic quality index. Haiti's GDP is $719 per capita. Other near-sustainability champions include Malawi, Nepal, Myanmar, and Nicaragua. All of them score dismally on the social indicators, and their GDPs per capita are $322, $799, $1,375, and $2,208, respectively. The country that currently comes closest to the researchers' ideal of remaining within its biophysical boundaries while sufficient social indicators is…Vietnam. For the record, Vietnam's per capita GDP is $2,306. "Countries with higher levels of life satisfaction and healthy life expectancy also tend to transgress more biophysical boundaries," the researchers note. A better way to put this relationship is that more wealth and technology tend to make people happier, healthier, and freer. O'Neill and his unhappy team fail drastically to understand how human ingenuity unleashed in markets is already well on the way toward making their supposed planetary boundaries irrelevant. Take carbon dioxide emissions: Supporters of renewable energy technologies say that their costs are already or will soon be lower than those of fossil fuels. Boosters of advanced nuclear reactors similarly argue that they can supply all of the carbon-free energy the world will need. There's a good chance that fleets of battery-powered self-driving vehicles will largely replace private cars and mass transit later in this century. Are we about to run out of phosphorous to fertilize our crops? Peak phosphorus is not at hand. The U.S. Geological Survey (USGS) reports that at current rates of mining, the world's known reserves will last 266 years. The estimated total resources of phosphate rock would last over 1,140 years. "There are no imminent shortages of phosphate rock," notes the USGS. With respect to the deleterious effects that using phosphorus to fertilize crops might have outside of farm fields, researchers are working on ways to endow crops with traits that enable them to use less while maintaining yields. O'Neill and his colleagues are also concerned that farmers are using too much nitrogen fertilizer, which runs off fields into the natural environment and contributes to deoxygenated dead zones in the oceans, among other ill effects. This is a problem, but one that plant breeders are already working to solve. For example, researchers at Arcadia Biosciences have used biotechnology to create nitrogen-efficient varieties of staples like rice and wheat that enable farmers to increase yields while significantly reducing fertilizer use. Meanwhile, other researchers are moving on projects to engineer the nitrogen fixation trait from legumes into cereal crops. In other words, the crops would make their own fertilizer from air. Water? Most water is devoted to the irrigation of crops; the ongoing development of drought-resistant and saline-tolerant crops will help with that. Hectares per capita? Humanity has probably already reached peak farmland, and nearly 400 million hectares will be restored to nature by 2060—an area almost double the size of the United States east of the Mississippi River. In fact, it is entirely possible that most animal farming will be replaced by resource-sparing lab-grown steaks, chops, and milk. Such developments in food production undermine the researchers' worries about overconsumption of biomass. And humanity's material footprint is likely to get smaller too as trends toward further dematerialization take hold. The price system is a superb mechanism for encouraging innovators to find ways to wring ever more value out less and less stuff. Rockefeller University researcher Jesse Ausubel has shown that this process of absolute dematerialization has already taken off for many commodities. After cranking their way through their models of doom, O'Neill and his colleagues lugubriously conclude: "If all people are to lead a good life within planetary boundaries, then the level of resource use associated with meeting basic needs must be dramatically reduced." They are right, but they are entirely backward with regard to how to achieve those goals. Economic growth provides the wealth and technologies needed to lift people from poverty while simultaneously lightening humanity's footprint on the natural world. Rather than degrowth, the planet—and especially its poor people—need more and faster economic growth.

#### No limits to growth---solar, nuclear, and fusion energy solve climate change better than degrowth

Michael Liebreich 18, Visiting Professor at Imperial College’s Energy Future Lab, “The Secret of Eternal Growth,” 10/29/18, http://ifreetrade.org/article/the\_secret\_of\_eternal\_growth\_the\_physics\_behind\_pro\_growth\_environmentalism

The earth, however, is not an isolated system. It may be nearly closed, exchanging limited matter across the planetary boundary, but it is far from isolated, as it receives a huge daily flux of energy from the sun and radiates almost as much away to space. In his book, Georgescu-Roegen even acknowledged the existence of huge solar energy fluxes, but that didn’t stop him from basing his seminal work on a scientific error. Later in his career, after ruefully acknowledging his mistake, he invented a Fourth Law of Thermodynamics, claiming that “material entropy” would forever prevent materials from being perfectly recycled. Pure fake science. Around the same time as Georgescu-Roegen was making up thermodynamic laws, a group of concerned environmentalists calling themselves the Club of Rome invited one of the doyens of the new field of computer modelling, Jay Forrester, to create a simulation of the world economy and its interaction with the environment. In 1972 his marvellous black box produced another best-seller, Limits to Growth (iv), which purported to prove that almost every combination of economic parameters ended up not just with growth slowing, but with an overshoot and collapse. This finding, so congenial to the model’s commissioners, stemmed entirely from errors in its structure, as pointed out by a then fresh-faced young economics professor at Yale, William Nordhaus. A third foundational work in the degrowth canon is Steady State Economics (v) by Herman Daly, later Senior Economist in the Environment Department of the World Bank. In it he explains that “the economy is an open subsystem of a finite and nongrowing ecosystem. Any subsystem of a finite nongrowing system must itself at some point also become nongrowing.” It’s a repeat of Georgescu-Roegen’s error. Daly must have known it too, since he noted that six days’ worth of radiation from the sun contained more useful energy (or exergy, to give it its correct name) than that embodied in all the fossil fuel reserves known at the time. The point here is not that solar power is the key to endless growth, though it could well be - nuclear fission and fusion are other strong contenders. The point is that when you scratch the surface of any of the seminal tracts of the degrowth movement, you find they are based on the same fake science, right through to the present day. Jeremy Rifkin’s 1980 Entropy: a New World View (vi) states that “here on earth material entropy is continually increasing and must ultimately reach a maximum”. In 2009, Professor Tim Jackson, the favourite anti-capitalist of the TED generation, published Prosperity Without Growth (vii). In it he pays homage to Daly’s “pioneering case for a ‘steady state economy’” and cheerfully recommends it to students hungering for alternative wisdom – either not understanding or not caring that it is based on a fallacy. This matters because, for all that the neo-liberal world economy has delivered extraordinary improvements in living standards – in life span, levels of education, infant survival, maternal health, poverty reduction, leisure, and so on (viii) – it is currently failing to address severe, systemic environmental challenges, first and foremost among them climate change. Unless the free-trade, pro-growth, pro-trade right offers a coherent plan, it is ceding the argument to the degrowth, anti-capitalist, anti-trade left. Climate change is real, serious, and urgent. That recent IPCC 1.5°C report is based on rigorous research. Of course climate change is being co-opted by the “Academic Grievance Studies” brigade (ix), but that doesn’t make the underlying physical science less real. As the world continues to burn through its remaining carbon budget, as temperatures continue to rise, as the ‘signal’ of climate damage becomes clearer against the background ‘noise’ of weather, the demand for dramatic action will only increase. Limiting the impact of climate change will require the application of technology, both new and yet-to-be-developed, on a heroic scale. Destroying the ability of the world economy to deliver these solutions is the very opposite of what we should be doing. And that is where Nordhaus and Romer come in. Romer’s great contribution was to identify the contribution of knowledge to economic growth. Before his Endogenous Growth Theory, no one could explain differences in growth rates of as much as 10 percent between countries at a similar stage of development. Romer’s work is the perfect riposte to those who think that economic growth is the same thing as ever-increasing physical material use and pollution; it is also the perfect riposte to those who believe that extractive industries can ever deliver long-term wealth and those who believe the same of agricultural subsidies and import tariffs. Nordhaus, for his part, was the creator of the first Integrated Assessment Models, bringing together the physics of climate change, its economic impact, and the functioning of the economy. He was also the first person to suggest that attaching a cost to emissions – low at first but rising – would squeeze greenhouse gases out of the economy. Nordhaus is no climate fundamentalist, famously diverging from the view propounded in the Stern Review, that the world needs super-high carbon taxes immediately. Nordhaus accepted that environmental challenges and climate change will act as a drag on the economy but, unlike others before him, he quantified the drag and showed that it is highly unlikely to reverse economic growth. Nordhaus and Romer are not the only Nobel Prize-winners whose work suggests that an open, liberal, trade-friendly economy – though one pricing in externalities – will do a better job of addressing climate change and other environmental problems than stalling or reversing economic growth. Simon Kuznets, who won the 1971 Nobel Prize for Economics (x), described how a variable can get worse in the early phases of a country’s development, and then improve as growth continues. He focused mainly on inequality, but the Environmental Kuznets Curves has been shown to govern most forms of local pollution. Ilya Prigogine won the 1977 Nobel Prize in Chemistry for his research into non-equilibrium “dissipative” structures – how a flow of energy across closed system can drive the creation of “order out of chaos” (xi). This is a real scientific expert on entropy proving that the economy can grow for as long as there is still a sun in the sky (which would give us about another five billion years).

#### Extinction’s inevitable---only growth can sustain colonization and solve extinction

**Skran 16** [Dale Skran is Executive Vice President of the National Space Society and a member of the Board of Directors of the Alliance for Space Development. “Settling space is the only sustainable reason for humans to be in space,” <http://www.thespacereview.com/article/2915/1>]

As robotic and artificial intelligence technologies improve and enable increasingly robust exploration without a human presence, eventually there will be only one sustainable reason for humans to be in space: settlement. Research into the recycling technology required for long-term off-Earth settlements will directly benefit terrestrial sustainability. Actively working toward developing and settling space will make available mineral and energy resources for use on Earth on a vast scale. Finally, space settlement offers the hope of long-term species survival that remaining on Earth does not. There are more than seven billion people on the Earth today. No rational space settlement advocate suggests that any significant portion of that population, or even of those who are rich, will be moving to Mars or anywhere else in space. However, a recent essay by Astro Teller, head of Google X Labs, and his wife Danielle, a physician and researcher takes the bold position that “It’s completely ridiculous to think that humans could live on Mars.” This essay, published by Quartz, repeats with little examination some of the hoariest arguments against space settlement. To support this view, the Tellers quote their 12-year-old daughter: “I can’t stand that people think we’re all going to live on Mars after we destroy our own planet.” This quote contains two mischaracterizations that demand refutation: that “we are all” going to live in space and that we are going to live in space after we destroy Earth. Another canard that has long floated about was given form by the recent film Elysium starring Matt Damon: the rich will leave the poor on the Earth and escape to space settlements. Upon examination, all three of these ideas are strawmen. There are more than seven billion people on the Earth today. No rational space settlement advocate suggests that any significant portion of that population, or even of those who are rich, will be moving to Mars or anywhere else in space. Instead, we expect that relatively small numbers of highly qualified individuals, or those who are deeply dedicated to living in space, would form the first settlements. Over a significant period of time, thousands more from the Earth would join those settlements as they become increasingly self-sufficient. Over more time, various possible niches for settlement (Moon, Mars, asteroids, free space, etc.) will be occupied, and eventually the population in space will total many millions, most of whom will have been born in space. So why then do Elon Musk, Stephen Hawking, and many others, including organizations like the National Space Society (NSS) and Alliance for Space Development, believe strongly that space settlement is essential to human survival? Although this may seem surprising, the Earth is not a “safe space.” The destiny of virtually all species on Earth is extinction in a relatively short span of geologic time. The Tellers claim that “we live on a planet that is perfect for us.” This statement is both completely true and total nonsense. We fit well on the Earth because we have evolved over millions of years to become creatures that are both adapted to live here and to like living here. It is truer to say that we are perfect for the Earth than the reverse. In fact, the Earth is not such a commodious place. It is subject to periodic calamities of various sorts, ranging from massive asteroid and comet impacts to titanic volcanic eruptions, and from periodic ice ages to disastrous solar flares. In the short run, the Earth seems balmy and comfortable. Viewed from the perspective of deep time, it starts to look more like a death trap, bedeviled by regular mass extinctions. However, things are actually quite a bit worse. Although there are many potentially bad things that might happen to the human race on the Earth from natural sources, there are many more from unnatural sources. We have been dancing with nuclear disaster for a long time. An apocalyptic atomic war is not inevitable, but it is possible. Add to this scenario the genetically engineered killer virus, “gray goo,” a robot revolt, and other horrors as yet undreamt, and the odds against human survival get longer. Hence, the need to abandon the fiction of Earth as our eternal and unchanging perfect home and to appreciate both the need for, and promise of, space settlement. Not so the rich can escape to an Elysium in the sky, or so we can all leave behind a polluted and overheated Earth, but simply so that the human species and human culture has a chance at surviving and flourishing in the long term. The Tellers believe that sustainability on the Earth has no relationship to what we do in space, but the same technologies that enable deep space settlement will have a profound impact on terrestrial sustainability. The Tellers write, “We haven’t even colonized the Sahara desert, the bottom of the oceans… because it makes no economic sense.” This may be true, but it also makes no sense to settle the Sahara desert, the bottom of the oceans, or Antarctica since these locations are on the Earth, and humans living there will not increase the probability of species survival. Near-Earth free space settlements and lunar bases are just stepping stones to ones much further out that are quarantined from Earth by millions of kilometers of vacuum. Once the motivation of species survival is put front and center, it becomes clear that a settlement in low Earth orbit, on the Moon, at L5, or on the Martian surface is not nearly sufficient. What is needed is a large set of thriving communities distributed throughout the solar system, and even ultimately in the Oort Cloud surrounding the solar system proper. This vision is not a small thing. It will be the work of many generations, just as was the settling of the New World or, even earlier in history, the human diaspora out of Africa along the Asian coast to Australia and beyond. The Tellers believe that sustainability on the Earth has no relationship to what we do in space, but the same technologies that enable deep space settlement will have a profound impact on terrestrial sustainability. Space settlements, of necessity, push the limits of food production per square meter and per liter of water. Space settlement agricultural methods can also be applied to growing food in parched California or in vertical farms in crowded urban areas. Space settlements require humans and technology to co-exist in close proximity. This implies an absolute minimization of pollution and sustained recycling of all waste. Such technologies seem highly applicable to sustainability on Earth as well. We will need to provide the best possible medical care for remote space settlements, which will be far from hospitals on Earth. The technologies that make such medicine effective—“tricorders”, telemedicine, and so on—can also bring medical care to underdeveloped and underserved areas of the Earth. The Tellers raise the specter of “winter-over syndrome” in the Antarctic, writing that “living on Mars would be way, way more miserable than living in Antarctica,” and concluding, “Nobody wants to live there.” Although it is clear that the Tellers will not be going, the large numbers who signed up for Mars One’s sketchy settlement plans suggest that a lot of people do want to live on Mars. There are real challenges to constructing space settlements, but current Antarctic bases are not true settlements. Nobody lives there with their families, with the exception of the coastal Esperanza Base, where about ten families routinely winter over. No real effort is made to create any kind of human environment that is comfortable over a long period of time. Conditions in Antarctica might be better compared to living in a campground than a self-sustaining settlement. Additionally, the current Antarctic Treaty essentially prevents any extraction or use of the natural resources found there, thus making economically independent settlements infeasible. The Tellers think that, from an economic perspective, “Mars has nothing to offer in return.” Here, at least in the short run, they have a point. Let us not shy from the truth. Conditions in the early settlements in the New World were difficult at best, and the casualty rate was high. We should expect the same to hold true for early space settlements. However, Jamestown and Plymouth gave rise to vast cities and a tamed landscape on a scale of hundreds of years. We now bring to the table technological means that would seem magical to the Jamestown settlers. Even as difficult an environment as the Moon can be developed and settled using technology that either exists currently or is an engineering project, as one book suggests. The Tellers think that, from an economic perspective, “Mars has nothing to offer in return.” Here, at least in the short run, they have a point. Although Mars may have more of the natural resources a settlement will need than, say, the Moon, it is at the bottom of a fairly steep gravity well and, for the time being, it is not likely that there will be many Mars-to-Earth exports. However, this is like looking at the resources of the New World via a keyhole, seeing a swamp, and reporting back that there is no point in going there. It is worth keeping in mind the example of “Seward’s Folly.” The purchase of Alaska from Russia was mocked as “Seward’s icebox” and a “polar bear garden.” At the time, the oil and mineral riches of Alaska were undiscovered and undreamt of. Space itself teems with valuable resources, including continuous and abundant solar energy and mineral wealth on a scale beyond imagination just in the near Earth asteroids. Just as the Tellers were dismissing space resources as irrelevant, the US Congress was laying the legal groundwork for asteroid and lunar mining with the passage of the Commercial Space Launch Competitiveness Act, signed by President Obama on November 23, 2015. The Tellers also seem unaware that their leadership at Google, Larry Page and Eric Schmidt, are investors in the asteroid mining firm Planetary Resources. The Tellers say that “we won’t survive [on Earth] unless we learn to live in a resource neutral way.” This statement assumes that that Earth is a closed system, which it is not. The Earth is flooded daily with vast amounts of solar energy that, if exploited, could power just about any civilization we wish to maintain. There is no technical limitation to providing continuous, carbon-free power from space solar power satellites beaming power back to the surface of the Earth anywhere it might be needed. The main opposition to this idea derives from an unwillingness to consider centralized power systems on ideological grounds, combined with the unexpected reality of very cheap natural gas today. Even the most conservative consideration of near-Earth asteroid resources suggests that there is no reason to view the Earth as a closed system to which nothing can be added. The time for the settlement of Mars will come, but first we need to build on our success in developing the resources of Earth orbit, in the form of navigation, Earth observation, communication, and weather satellites, by fully developing the economic potential of the Earth-Moon system. Space settlements must flow out of the development of the economic resources of space if they are to be sustainable in the long term. The NSS has developed a complete description of milestones toward the development of space settlements. In view of the above, Astro Teller was probably right to turn down the “space cadet” who wanted Google X to spend money on Mars settlement. But wait—Google is doing exactly that. A key first step toward space settlement is ensuring a gapless transition from the existing International Space Station to commercially owned and operated LEO space stations as described in the NSS position paper “Next Generation Space Stations.” Next will come the development of the resources of the Moon and neaby asteroids leading to the creation of a self-sustaining Earth-Moon economy. Once we have established an asteroid-Earth-Moon economy that makes the resources found in this region fully available for projects ranging from the construction of solar power satellites to fueling future Mars missions, trips to Mars will be far less of a reach than they are today. In view of the above, Astro Teller was probably right to turn down the “space cadet” who wanted Google X to spend money on Mars settlement. Currently Google’s money would be better spent in low Earth orbit, among the asteroids, and on the Moon, joining forces with the growing number of entrepreneurs seeking their fortunes in space. But wait—Google is doing exactly that by sponsoring the Google Lunar X PRIZE to encourage private groups to send landers to the Moon, and investing $900 million in Elon Musk’s SpaceX. Given that corporate Google (now Alphabet) has just made a massive investment in a company founded to settle Mars, the Tellers’ essay sounds a bit like sour grapes. In any case, the Tellers are completely wrong in their disregard of the potential economic benefits of space development and the underlying motivation for space settlement.

#### It’s possible, not inevitable

Spring 16 – BA in journalism from Purchase College, SUNY (Todd, "A Case for Capitalism, In Regards to Space Travel," Medium, <https://thepolicy.us/a-case-for-capitalism-in-regards-to-space-travel-d77e50f8116e)//> gcd

In the news yesterday was an article about how Elon Musk plans to start sending ~~men~~ [people] to Mars in the year 2024 — a mere eight years away. Although the project may be ambitious — ridiculous even — if anyone can pull it off it is Elon Musk and his company SpaceX. And regardless of whether he succeeds in his quest or whether he does not succeed, the point will remain: At least he had the courage to try. For years, we have been waiting for N.A.S.A. (or some other government-funded agency) to begin pulling up their breeches when it comes to the manned exploration of our solar system…but thus far they have not been able to get their act together. We have waited and waited, but as of yet nothing has come to pass but brief mention of such travels here and there…like a wind with neither haste nor purpose. As of now, N.A.S.A. does not plan on sending a manned mission to Mars until the 2030s — assuming, of course, they get the government funding they need to undertake such a massive project. Considering the recent cuts to deep space exploration, down nearly $300 million from 2016, I am not certain what the condition of the program will look like in another two years…much less the gap between now and the 2030s. Where, then — if the government and its agencies will not provide us with the money for exploration — will we turn to slake our thirst for cosmic space travel? SpaceX. Private corporations. Capitalism. Seeing this article in the news, reading day after day the story of budget cuts to N.A.S.A. in regards to deep-space exploration and other related programs, got me thinking about just how important it will be for private companies and corporations to undertake these projects…such as Elon Musk’s SpaceX, and countless others (read the full list here). The problem is that we have gotten it into our heads that Capitalism is the root cause of our economic woes in the United States, perhaps failing to understand that such policies are something like a double-edged sword: they could also be our salvation. This article provides a great list of the pro’s and con’s of Capitalism. I would recommend you take the short passing of time it requires to read it through-and-through before continuing. Now then. I have never been for for fully-unhindered Capitalism. I do not believe that the government should stay out of economic affairs entirely, for as provided in the article many of the con’s relate to improper regulation (monopolization) as opposed to something fundamentally wrong, but I do not believe that any government should be going about shoving their claws into every economic affair either. There must be a healthy balance, especially if Capitalism is to work as it is supposed to work. The same goes for any policy. The government should be there to bolster competition between businesses…not favor one or bail-out the other. The more regulation, the more interference or amendment, the less it works…but this mix of regulation and free market must fall in the “goldilocks zone” if the citizens of said society are to reap its full benefit. If not, like planets about a star, the society shall either burn or freeze. One of those benefits is highlighted by Elon Musk’s SpaceX: the intervention of privately-funded companies to do things that a traditional government agency cannot. Namely, the exploration and eventual colonization of Mars in a reasonable, step-by-step timeframe…unlike the “we will get to it eventually” mindset plaguing the bowels of the United States government. Were not the policies in place to foster the growth of private companies, our best chance at getting people out of Earth-orbit — the Bush-approved, now-cancelled, insanely-expensive Constellation program — would have gone the way of promises and well-wishes. It is my hope that Elon Musk and space entrepreneurs like him are not simply blowing steam, and that one day — perhaps even within my lifetime — I could be on my way to a space hotel on the Moon, flying aboard a space airliner with the name of a private company plastered across the side. Regardless, if we humans are to truly become a multi-planet species we must not hinder economic growth with narrow thoughts. We must not become confused that the “problems down here” and the “problem of getting out there” must be in conflict; they do not need to, and we must not suppose they should. They are two separate issues with two unique sets of problems, and thus this policy of taking resources from one to give to the other will only ensure that neither issue is given that which it needs, or enough to fix what must be solved. Therefore I propose that we support these pioneers of space travel in any way that we are able. Let us not forget that solving the issue of “how do we get there” might just lead to the end of our “problems down here”.

#### Cap net reduces war

Mousseau, 19—Professor in the School of Politics, Security, and International Affairs at the University of Central Florida (Michael, “The End of War: How a Robust Marketplace and Liberal Hegemony Are Leading to Perpetual World Peace,” International Security, Volume 44, Issue 1, Summer 2019, p.160-196, dml)

Is war becoming obsolete? There is wide agreement among scholars that war has been in sharp decline since the defeat of the Axis powers in 1945, even as there is little agreement as to its cause.1 Realists reject the idea that this trend will continue, citing states' concerns with the “security dilemma”: that is, in anarchy states must assume that any state that can attack will; therefore, power equals threat, and changes in relative power result in conflict and war.2 Discussing the rise of China, Graham Allison calls this condition “Thucydides's Trap,” a reference to the ancient Greek's claim that Sparta's fear of Athens' growing power led to the Peloponnesian War.3

This article argues that there is no Thucydides Trap in international politics. Rather, the world is moving rapidly toward permanent peace, possibly in our lifetime. Drawing on economic norms theory,4 I show that what sometimes appears to be a Thucydides Trap may instead be a function of factors strictly internal to states and that these factors vary among them. In brief, leaders of states with advanced market-oriented economies have foremost interests in the principle of self-determination for all states, large and small, as the foundation for a robust global marketplace. War among these states, even making preparations for war, is not possible, because they are in a natural alliance to preserve and protect the global order. In contrast, leaders of states with weak internal markets have little interest in the global marketplace; they pursue wealth not through commerce, but through wars of expansion and demands for tribute. For these states, power equals threat, and therefore they tend to balance against the power of all states. Fearing stronger states, however, minor powers with weak internal markets tend to constrain their expansionist inclinations and, for security reasons, bandwagon with the relatively benign market-oriented powers.

I argue that this liberal global hierarchy is unwittingly but systematically buttressing states' embrace of market norms and values that, if left uninterrupted, is likely to culminate in permanent world peace, perhaps even something close to harmony. My argument challenges the realist assertion that great powers are engaged in a timeless competition over global leadership, because hegemony cannot exist among great powers with weak markets; these inherently expansionist states live in constant fear and therefore normally balance against the strongest state and its allies.5 Hegemony can exist only among market-oriented powers, because only they care about global order. Yet, there can be no competition for leadership among market powers, because they always agree with the goal of their strongest member (currently the United States) to preserve and protect the global order \

#### US economic strength is an impact filter---creates a cap on escalation and rules governing emerging tech

Burrows 16 [Mathew Burrows, Director of the Atlantic Council’s Strategic Foresight Initiative, PhD in European History from the University of Cambridge, Appointed Director of the Analysis and Production Staff (APS) in 2010, September 2016, “Global Risks 2035: Mathew J. Burrows Foreword by Brent Scowcroft The Search for a New Normal” Atlantic Council Strategy Papers, http://espas.eu/orbis/sites/default/files/generated/document/en/Global\_Risks\_2035\_web\_0922.pdf]

The multilateralist global system that the United States and the West built after the end of the Second World War was premised on an economically strong United States and West. In 1945, the United States was the only victor that was not completely devastated. World War II had brought the country out of the Great Depression, and the US GDP constituted more than 50 percent of the world’s total. Into the twenty-first century, the members of the Group of Seven (G7) were the world’s political and economic heavyweights. It has only been in the past several years that the collective GDP of the developing world—led by China—has surpassed the developed world’s. Even as non-Western powers grow, it is psychologically hard for the West to think about relinquishing its reins. Demographically, the West has, for a long time, been in the minority. What’s more recent is the aging of the Western population (analyzed in chapter 2), which is already occurring in Japan and Europe, beginning to squeeze the availability of resources for anything but health, social security, and interest payments on debt. Unless healthcare becomes far more efficient, the US economy will be overburdened with healthcare and pension costs as the “baby boomer” generation ages. Healthcare constitutes a whopping 18 percent of the US GDP—significantly more than is the case for other industrialized countries—without necessarily providing better results. With more going to health and pensions, there will be less capacity for defense and military spending. The United States is the biggest military spender, but China is increasing its portion of worldwide military spending, while the worldwide share of European NATO members is diminishing. China’s military probably will not rival the United States’ power-projection capabilities even by 2035, but it will have greater anti-access and denial powers. In a military contest, China may never be able to deliver a knockout blow, but it could tarnish the US image of military invincibility in a conventional state-on-state contest held in its region. Equally, a confrontation that results in a Chinese humiliation could set back China’s aspirations for regional leadership, if not trigger a domestic legitimacy crisis for the Communist Party leadership. Biggest Problem Is Domestic The biggest psychological blow to ordinary Western citizens has been their sagging standard of living (more analysis in chapter 1). Despite a much better record of overall growth in the United States since the 2008 financial crisis, those with median incomes have taken a hit. Worrisome for future US growth potential has been the drop in the labor-participation rate, from the 67 percent range before the 2008 financial crisis to 62-63 percent in the years since. The labor-participation rate was destined to drop due to a growing numbers of retirees, but much of the current sharp decrease comes from unskilled males in their prime working years—forties and early fifties—dropping out. Additionally, many younger women are not entering or staying in the job market. Global Trends 2030 looked at two scenarios for future US growth—one in which the United States maintained or slightly increased its average 2.5 percent pre-2008 growth rate, or one in which growth would slow to an average of 1.5 percent a year. In the first, there would still be the global economic shift to China. On the other hand, the 2.5 percent average growth would help boost average living standards, engendering a “feel-good” factor, which would make more Americans interested in reengaging with world issues.91 Given the record of slower growth and labor-force decline since the 2008 financial crisis, the likelihood of the second scenario is increasing. That scenario anticipated lower growth rates—which accelerated declines in average living standards—making it harder to continue trade-liberalization efforts. Indeed, the IMF warned in June 2016 that the United States faces potentially significant longer-term challenges to strong and sustained growth, saying, “concerted policy actions are warranted, sooner rather than later… focusing on the causes and consequences of falling labor force participation, an increasingly polarized income distribution, high levels of poverty, and weak productivity.”92 Moreover, it is not as if traditional US partners—Europe and Japan—are doing much better. Japan and many European countries are aging faster than the United States, eliminating labor-force growth as a driver of future economic growth. Europe’s and Japan’s economic performances have been declining since the 1990s. In Europe, the public discontent with high unemployment and declining incomes has helped to spur the rise of antiestablishment far-right and populist parties that want to weaken the EU and transatlantic ties. Even in richer European countries, such as Germany, a backlash has been growing against the Transatlantic Trade and Investment Partnership (TTIP), out of fear that Europe’s rewards would be meager and European standards would be diluted. McKinsey Global Institute, for example, believes a “return to sustained growth of 2-to-3 percent” is possible for Europe, but would require many politically difficult reforms.93 These include: reducing dependence on imports (much coming from Russia) for crude oil and natural gas; fostering a more vibrant digital economy; increasing workforce participation by the elderly, women, and migrants; and promoting flexibility in labor markets. China now spends a greater share of its GDP on research and development than does Europe. The latest OECD figures show that Europe now spends even less than the rest of the OECD.94 In both the United States and Europe, there is increasing anti-immigrant sentiment despite documented economic benefits from immigration. According to EU Commission Employment Analyst Dr. Jorg Peschner, productivity, by itself, will not be enough to reverse the negative employment trend absent more immigration: “EU’s productivity growth would have to double in order to keep the EU’s economy growing at the same pace as it did before the crisis started.” For employment growth to remain positive as long as possible, improving the labor participation of women, low-educated people, and migrants will also have to be a priority. In the United States, many of the new businesses started every year are started by first- or second-generation immigrants.95 Politically, there has been a large rise in support for right-wing and populist parties in the United States and Europe, undermining traditional parties. The gaps, for example, between the leadership and supporters in the US Republican and UK Tory and Labor Parties have been particularly evident in the selection of Donald Trump as presidential candidate and the June 2016 victory of the “Leave” vote in Britain. Unfortunately, there is no end of economic disruption. The job churn will continue as more and more skills and professions are automated, also increasing the potential for more “losers” from globalization, greater political polarization, and inequality. The increased competitiveness of the developing world with the West is a particular morale buster for Western middle classes who got used to ever-increasing prosperity for themselves and succeeding generations. Adapting to a new norm of economic turbulence—more prevalent in other eras—may be one of the biggest mental hurdles for Westerners. The West is used to thinking of the “Third World,” not home, as the place where economic turmoil happens. And a Multipolar Financial Architecture, Too Historically, US and Western power has rested on having a monopoly on reserve currencies and a Westerndominated financial system. In 2035, the dollar will be the biggest reserve currency, but its share of global financial transactions is expected to drop from 60 percent today to 45 percent. The euro will probably remain the second reserve currency, while the Chinese yuan or RMB—which became a part of the IMF benchmark-currency basket in 2015—will become a third reserve currency, accounting for 10 to 15 percent of global finance in two decades’ time.96 The financial architecture will also become more regionalized. The central role played by the financial centers of New York and London will also diminish, and a multitiered financial architecture will develop. Following the UK Brexit, those centers’ share in financial intermediation will decrease, as a second pole of global finance forms in the Eurozone. A third pole will develop in East Asia and Southeast Asia. Gradually, a growing share of global financial resources will be concentrated in those regional clusters. As with the growth of regional trade, the regional clusters will be more self-encapsulated, spurred by rising domestic demand in China and other developing countries with growing middle classes. With the role of electronic money likely to grow, the traditional banking system will probably also undergo major revision, with potential impacts on governmental powers. A more multipolar reserve system and regionalized financial architecture should lessen risks and contribute to greater stability. But the large-scale technological innovations—some of which contributed to the 2008 breakdown—will continue, making global finance still volatile. Emerging-market countries with fragmentary regulatory regimes will be particularly prone to suffering financial crises. The agingpopulation factor also increases risks to public finances. This report anticipates modestly increased volatility, lower than what occurred in the global economy during the 1890s through the 1940s, but higher than in the 1950s and 1960s—more of a continuation of what has been the trend line since the mid-1980s. Are There Alternative Visions to Western Order? Four years ago, when Global Trends 2030 was published, the answer was largely no.97 Increasingly, the facts on the ground would suggest otherwise. They do not add up to a cohesive plan to substitute wholesale all Western institutions and practices. However, they clearly indicate that there are some no-go areas, particularly those connected to regime change, democracy promotion, state control over NGOs, and maintaining sovereignty. Russia and China, in particular, see themselves as great powers and, as such, believe they have special rights to dominance in their regions. However, as other powers like India develop, it is likely that they will see themselves as regional powers with inherent prerogatives. It is worth recalling the United States’ expansive Manifest Destiny and nineteenth-century Monroe Doctrine, claiming special rights to determine the future of the Western Hemisphere. The Mercator Institute for China Studies (MERICS) has been closely following Beijing’s efforts to build a network of parallel structures to existing international organizations. It has concluded that China “is not seeking to demolish or exit from current international organizations…It is constructing supplementary— in part complementary, in part competitive—channels for shaping the international order beyond Western claims to leadership.”98 As the accompanying chart indicates, China’s shadow network of alternative international structures encompasses everything from financial and economic partnerships (the Silk Road Economic Belt and the Asian Infrastructure Investment Bank) to full-blown political groupings like the Shanghai Cooperation Organization, Conference on Interaction and Confidence Building Measures in Asia (CICA), and the BRICS association of Brazil, Russia, India, China, and South Africa.99 Moreover, there is increasing cooperation among many of the emerging powers—beyond just authoritarians—to not just limit what they see as Western meddling in domestic affairs, but to go on the attack globally. According to a recent academic study, the “Big Five” authoritarian states of China, Russia, Iran, Saudi Arabia, and Venezuela “have taken more coordinated and decisive action to contain democracy on the global level.” They have sought to “alter the democracy and human-rights mechanisms of key rulesbased institutions, including the Organization of American States, the Council of Europe, the Organization for Security and Cooperation in Europe, and international bodies concerned with the governance of the Internet.”100 How durable are these preferences for nondemocracy and state control? By 2035, if not sooner (in the case of Venezuela), some of the now-authoritarian states could be liberalized, and the perceived threat posed by Western civil-society NGOs may ease. However, China and Russia are more likely than not to want to dominate their regions. Nationalism and democracy have been shown to be highly compatible. It is not clear that an even more powerful China or India would defer to Western leadership of the global order, even if both sides’ values in other areas begin to converge. What Kind of Post-Western World? Clearly, there is a need to plan for a world that will not have the West as its big economic powerhouse—a prospect hard for Western elites and publics to conceive of, despite a decade or more of publicity about the “rise of the rest.” According to a recent survey, Europeans and Americans are more comfortable with each other than they are with anybody else. Although a majority of Europeans said, in the most recent German Marshall Fund transatlantic-trends polling, that they would like to see their country take an approach more independent from the United States, both Americans and Europeans still prefer each other over more Russian or Chinese leadership in the world. The Obama administration—considered among the most multilateralist of recent administrations— campaigned hard in 2015 to convince Europeans not to join China’s proposed Asian Infrastructure and Investment Bank (AIIB). It was as if the United States was against any governance structure not “made in the USA,” even when those running the AIIB have made clear their intentions of operating with the World Bank and the Asian Development Bank. More and more, the talk among Western elites is about locking in as much as possible the status quo, which favors the West, so that it will be harder for the newcomers to overcome. The TPP was sold as a way to set the rules before China gains much more power. A former Obama administration official advised that now might be the best time to undertake UN Security Council reform, before China and other uncooperative powers become more powerful. “A new US administration may be able to advance a proposal to address the Security Council’s anachronistic makeup while perpetuating a council that Washington can work with.”101 For Westerners, the challenge will be to plan for a future that will not be solely run by them, but which they can live with. Handovers have been historically difficult and fraught—more often than not, decided by bloody contests. One could envisage different scenarios, some already described in the earlier chapter on conflict, of military contests between the United States and China, or the United States and China with Russia, or the United States with NATO against Russia. Without delivering a knockout blow by one side or the other, these contests would most likely pit West against East, creating something akin to a new Cold War. Even if there were a knockout blow by the United States against China, it is hard to imagine a defeated China deferring permanently to the West. Its population has been imbued with such a narrative about the injustices by the West against China that any defeat or setback would be confirmation that the United States and West are dead set against a rising China. Perhaps the most harmful effect of such a contest would be to convince both sides that neither is trustworthy. For the non-West, it would confirm the suspicion that the West does not want to relinquish its leadership position. For the West, it would make it harder to ever reach out and help establish a truly global system. Need for a Second-Generation US and Western Leadership Model War is not, and should not be, inevitable as the West struggles with the growing clout of China and other developing states on the world stage. Unlike during other transitions, the tools exist for ensuring more peaceful outcomes. They will require Western acquiescence to greater roles for the developing world to set and implement new rules of the road for the international order. A key feature of the post-1945 US design for the world order is its multilateralist structures. Many of these operate below most people’s radar. This plumbing of the international system has enabled the daily functioning of globalization. To keep it viable, China, as well as other developing countries, must be accorded more representation. There are too many long-term risks involved, for example, in China having only the equivalent of France’s voting rights in the IMF, when it is the first or second economic power in the world. This is how resentments are nurtured—all the more dangerous in China’s case because of its underlying “century of humiliation” mental complex. As emerging technologies come online, the lack of a truly global institutional framework could be particularly dangerous. Assuring the future security of the Internet is particularly important in this regard, because all the new emerging technologies—bio, 3D printing, robotics, big data—take for granted a secure, global Internet. Everyone loses if cyber crime and cyber terrorism undermine the Internet. In the worstcase scenarios, in which cyber crime proliferates or strong national borders fragment the Internet, an Atlantic Council study, as mentioned, found that the economic costs could be as much as $90 trillion out to 2030, in addition to the risk of open conflict.102 Besides bringing the emerging powers into leadership roles in the panoply of multilateral institutions, the United States will need to temper its often “exemptionalist” stance to ensure the survival of the multilateralist order. According to the Council on Foreign Relations’ Patrick Stewart, a prominent scholar of global governance, one of the persistent paradoxes of the post-1945 decades has been that the “United States is at once the world’s most vocal champion of a rules-based international order and the power most insistent on opting out of the constraints that it hopes to see binding on others.”103 No country has the networks and connections that the United States does, but the system is now polycentric, rather than unipolar, and others resent the “exceptional” privileges that the United States claims. The Global Trends works have talked about the need for a new model of US global leadership. The United States needs to be guiding the international system as a “first among equals,” and willing to play by its own rules. Paradoxically, there is likely to be no vibrant global-governance system without US and Western leadership, but too much domineering behavior could doom it. Even if the United States adapted its global role, this is not to say that the tensions and differences with many emerging powers would all disappear, or that the governance system would function seamlessly. In addition to the growing number of new state actors, the increasing importance of nonstate actors adds a new complexity to the functioning of global institutions. Moreover, there are clear-cut differences between the West and emerging powers on values-based issues, such as democracy promotion and the responsibility to protect. Many developing-country publics still resent Western colonialism and equate any intrusion with past historical wrong. They point to the 2011 humanitarian intervention in Libya, for example, as cover for the Western goal of regime change. Hence, the UN Security Council failure to stop the fighting in Syria, with more than two hundred thousand killed and 7.6 million displaced. Russia and China want to make a stand against the United States and the West getting their way and ousting the Assad regime. On the other hand, the lack of a solution smacks more of anarchy than global governance. Certainly, it shows one of the gaps that remains, and likely will remain, limiting global governance because of differences in values. The speed with which new technologies are coming online and becoming an important political, military, and economic tool—for both good and bad—carries big risks for global governance. Stewart Patrick lists four potential new technologies that “cry out for regulation”: geoengineering, drones, synthetic biology, and nanotechnology. Without some setting of rules for their operation, there is the risk of major disruptions, if not catastrophes, stemming from their abuse. The recent advances in synthetic biology lower the bar to abuse by amateurs and terrorists alike, forever affecting human DNA. Geoengineering involves planetaryscale interventions that could interfere with complex climatic systems. However cumbersome, politically unpopular, and ineffective at times, there is little alternative to increased global cooperation if one does not want to see higher risks of conflict and economic degradation. Without some sort of bolstered global governance, the West would end up with less sovereignty in a “dog-eat-dog” world, in which it was increasingly in the minority. But can the United States and the West rise to the challenge of investing in a global-governance system that will not always favor their interests on every issue? Historically, the United States could be especially generous because it was on top of the world in about everything after the Second World War. Europeans came to truly believe in pooling sovereignty and joint governance after centuries of internecine conflict. The tough economic times at home have seen US and European publics become distrustful of overarching multilateral institutions, believing the will of the United States or individual European countries will not be served. It is oftentimes easier for political leaders to fall in with the public mood rather than display leadership that might appear to work against it. Over time, economic power will also be consolidated in Asia, replicating the situation three centuries ago, when China and India were the biggest economic powers in the world, and the center of the global economy was in the East. Over a longer term, one could also see a concentration in just three countries: The breakdown of the post-Cold War political and security order is irrevocable. Not only are there new powers—particularly China—that do not share the West’s vision of a liberal order, but Western publics themselves have turned against globalization, which has been the overall megatrend of the past three decades. The geopolitical landscape ahead will be much different. The best case is looking at multipolarity with limited multilateralism. In the worst case, that multipolarity evolves into bipolarity with China, Russia, and their partners pitted against the United States, Europe, Japan, and other allies. In that scenario, conflict would be almost inevitable.

#### Unregulated emerging tech causes extinction.

Tate et al. 15 – (Jitendra S. Tate, Ph.D., Mechanical Engineering, M.S. & B.S., Mechanical Engineering; Sergio Espinoza; Davontae Habbit; Craig Hanks; Walk Trybula; Dominick Fazarro; “JOTS v41n1 - Military And National Security Implications Of Nanotechnology”; Virginia Tech University Press; D.A. June 24th 2020, [Published Spring 2015]; <https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html>) //LFS—JCM

The purpose of country’s armed forces is to provide protection from foreign threats and from internal conflict. On the other hand, they may also harm a society by engaging in counter- productive warfare or serving as an economic burden. Expenditures on science and technology to develop weapons and systems sometimes produces side benefits, such as new medicines, technologies, or materials. Being ahead in military technology provides an important advantage in armed conflict. Thus, all potential opponents have a strong motive for military research and development. From the perspective of international security and arms control it appears that in depth studies of the social science of these implications has hardly begun. Warnings about this emerging technology have been sounded against excessive promises made too soon. The public may be too caught up with a “nanohype” ( [Gubrud & Altmann, 2002](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#gubrud)). It is essential to address questions of possible dangers arising from military use of nanotechnology and its impacts on national security. Their consequences need to be analyzed.

NT and Preventative Arms Control  
Background

The goal of preventive arms control is to limit how the development of future weapons could create horrific situations, as seen in the past world wars. A qualitative method here is to design boundaries which could limit the creation of new military technologies before they are ever deployed or even thought of. One criterion regards arms control and how the development of military and surveillance technologies could go beyond the limits of international law warfare and control agreements. This could include autonomous fighting war machines failing to define combatants

of either side and Biological weapons could possibly give terrorist circumvention over existing treaties ( [Altmann & Gubrud, Military, arms control, and security aspects of nanotechnology, 2004](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#altmann5)). The second criterion is to prevent destabilization of the military situation which emerging technologies could make response times in battle much faster. Who will strike first? The third criterion, according to Altman & Gubrud, is how to consider unintended hazards to humans, the environment, and society. Nanoscience is paving the way for smaller more efficient systems which could leak into civilian sectors that could bring risks to human health and personal data. Concrete data on how this will affect humans or the environment is still uncertain.

Arms Control Agreements  
The development of smaller chemical or biological weapons that may contain less to no metal could potentially violate existing international laws of warfare by becoming virtually undetectable. Smaller weapons could fall into categories that would undermine peace treaties. The manipulation of these weapons by terrorist could give a better opportunity to select specific targets for assassination. Anti- satellite attacks by smaller more autonomous satellites could potentially destabilize the space situation. Therefore a comprehensive ban on space weapons should be established ( [Altmann & Gubrud, 2002](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#altmann3)). Autonomous robots with a degree of artificial intelligence will potentially bring great problems. The ability to identify a soldiers current situation such as a plea for surrender, a call for medical attention, or illness is a a very complicated tasks that to an extent requires human intelligence. This could potentially violate humanitarian law.

Stability  
New weapons could pressure the military to prevent attacks by pursuing the development of new technologies faster. This could lead to an arms race with other nations trying to attain the same goal. Destabilization may occur through faster action, and more available nano systems. Vehicles will become much lighter and will be used for surveillance. This will significantly reduce time to acquire a targets location. Medical devices implanted in soldiers’ bodies will enable the release of drugs that influence mood and response times. For example, an implant that attaches to the brains nervous system could give the possibility to reduce reaction time by processing information much faster than usual ( [Altmann & Gubrud, Anticipating military nanotechnology, 2004](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#altmann4)). Artificial intelligence based genetic algorithms could make tactical decisions much faster through computational power by adapting to a situations decision. Nano robots could eavesdrop, manipulate or even destroy targets while at the same time being undetected ( [Altmann J. , Military Uses of Nanotechnology: Perspectives and Concerns, 2004](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#altmann1)).

Environment Society & Humans  
Human beings have always been exposed to natural reoccurring nanomaterials in nature. These particles may enter the human body through respiration, and ingestion ( [Bennet- Woods, 2008](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#bennet)). Little been known about how manufactured nanoscale materials will have an impact to the environment. Jerome (2005) argues that nanomaterials used for military uniforms could break of and enter the body and environment. New materials could destroy species of plants and animal. Fumes from fuel additives could be inhaled by military personnel. Contaminant due to weapon blasts could lead to diseases such as cancer or leukemia due to absorption through the skin or inhalation. Improper disposal of batteries using nano particles could also affect a wide variety of species. An increase in nanoparticle release into the environment could be aided by waste streams from military research facilities. Advanced nuclear weapons that are miniaturized may leave large areas of soil contaminated with radioactive materials. There is an increase in toxicity as the particle size decrease which could cause unknown environmental changes. Bennet-woods ( [2008](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#bennet)) argues that there is great uncertainty in which the way nano materials will degrade under natural conditions and interact with local organisms in the environment.

Danger to society could greatly be affected due to self-replicating, mutating, mechanical or biological plagues. In the event that these intelligent nano systems were to be unleashed, they could potentially attack the physical world. There are a number of applications that will be developed with nanotechnology that could potentially crossover from the military to national security that can harm the civilian sector ( [Bennet-Woods, 2008](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#bennet)). There is a heightened awareness that new technologies will allow for a more efficient access to personal privacy and autonomy ( [Roco & Bainbridge, 2005](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html" \l "roco2)). Concerns regarding artificial intelligence acquiring a vast amount of personal data, voice recognition, and financial data will also arise. Implantable brain devices, intended for communication, raise concerns for actually observing and manipulating thoughts. Some of the most feared risks due to nanotechnology in the society are the loss of privacy ( [Flagg, 2005](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#flagg)). Nano sensors developed for the battlefield could be used for eavesdropping and tracking of citizens by state agencies. This could lead to improvised warfare or terrorism. Bennet-Woods ( [2008](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#bennet)) argues that there should be an outright ban on nanoenabled tracking and surveillance devices for any purpose.

Nanotechnology in combination with biotechnology and medicine raise concerns regarding human safety. This includes nanoscale drugs that may allow for improvements in terrorism alongside more efficient soldiers for combat. Bioterrorism could greatly be improved through nano-engineered drugs and chemicals ( [Milleson, 2013](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html" \l "milleson)). Body implants could be used by soldiers to provide for better fighting efficiency but in the society, the extent in which the availability of body manipulation will have to be debated at large ( [Altmann J. , Nanotechnology and preventive arms control, 2005](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#altmann1)). Brain implanted stimulates could become addictive and lead to health defects. The availability of body and brain implants could have negative effects during peace time. Milleson ( [2013](https://scholar.lib.vt.edu/ejournals/JOTS/v41/v41n1/tate.html#milleson)) argues that there is fear that this technology could destabilize the human race, society, and family. Thus, the use in society should be delayed for at least a decade.

#### Long term trends are driving decoupling---growth is sustainable and self correcting

Brook et al. 15—professor of environmental sustainability at the University of Tasmania (Barry, with John Asafu-Adjaye, University of Queensland, Linus Blomqvist, Breakthrough Institute, Stewart Brand, Long Now Foundation, Ruth DeFries, Columbia Univeristy, Erle Ellis, University of Maryland, Baltimore County, Christopher Foreman, University of Maryland School of Public Policy, David Keith, Harvard University School of Engineering and Applied Sciences, Martin Lewis, Stanford University, Mark Lynas, Cornell University, Ted Nordhaus, Breakthrough Institute, Roger Pielke, Jr., University of Colorado, Boulder, Rachel Pritzker, Pritzker Innovation Fund, Joyashree Roy, Jadavpur University, Mark Sagoff, George Mason University, Michael Shellenberger, Breakthrough Institute, Robert Stone, Filmmaker, and Peter Teague, Breakthrough Institute, “AN ECOMODERNIST MANIFESTO,” <http://www.ecomodernism.org/manifesto/>, dml)

Intensifying many human activities — particularly farming, energy extraction, forestry, and settlement — so that they use less land and interfere less with the natural world is the key to decoupling human development from environmental impacts. These socioeconomic and technological processes are central to economic modernization and environmental protection. Together they allow people to mitigate climate change, to spare nature, and to alleviate global poverty. Although we have to date written separately, our views are increasingly discussed as a whole. We call ourselves ecopragmatists and ecomodernists. We offer this statement to affirm and to clarify our views and to describe our vision for putting humankind’s extraordinary powers in the service of creating a good Anthropocene. 1. Humanity has flourished over the past two centuries. Average life expectancy has increased from 30 to 70 years, resulting in a large and growing population able to live in many different environments. Humanity has made extraordinary progress in reducing the incidence and impacts of infectious diseases, and it has become more resilient to extreme weather and other natural disasters. Violence in all forms has declined significantly and is probably at the lowest per capita level ever experienced by the human species, the horrors of the 20th century and present-day terrorism notwithstanding. Globally, human beings have moved from autocratic government toward liberal democracy characterized by the rule of law and increased freedom. Personal, economic, and political liberties have spread worldwide and are today largely accepted as universal values. Modernization liberates women from traditional gender roles, increasing their control of their fertility. Historically large numbers of humans — both in percentage and in absolute terms — are free from insecurity, penury, and servitude. At the same time, human flourishing has taken a serious toll on natural, nonhuman environments and wildlife. Humans use about half of the planet’s ice-free land, mostly for pasture, crops, and production forestry. Of the land once covered by forests, 20 percent has been converted to human use. Populations of many mammals, amphibians, and birds have declined by more than 50 percent in the past 40 years alone. More than 100 species from those groups went extinct in the 20th century, and about 785 since 1500. As we write, only four northern white rhinos are confirmed to exist. Given that humans are completely dependent on the living biosphere, how is it possible that people are doing so much damage to natural systems without doing more harm to themselves? The role that technology plays in reducing humanity’s dependence on nature explains this paradox. Human technologies, from those that first enabled agriculture to replace hunting and gathering, to those that drive today’s globalized economy, have made humans less reliant upon the many ecosystems that once provided their only sustenance, even as those same ecosystems have often been left deeply damaged. Despite frequent assertions starting in the 1970s of fundamental “limits to growth,” there is still remarkably little evidence that human population and economic expansion will outstrip the capacity to grow food or procure critical material resources in the foreseeable future. To the degree to which there are fixed physical boundaries to human consumption, they are so theoretical as to be functionally irrelevant. The amount of solar radiation that hits the Earth, for instance, is ultimately finite but represents no meaningful constraint upon human endeavors. Human civilization can flourish for centuries and millennia on energy delivered from a closed uranium or thorium fuel cycle, or from hydrogen-deuterium fusion. With proper management, humans are at no risk of lacking sufficient agricultural land for food. Given plentiful land and unlimited energy, substitutes for other material inputs to human well-being can easily be found if those inputs become scarce or expensive. There remain, however, serious long-term environmental threats to human well-being, such as anthropogenic climate change, stratospheric ozone depletion, and ocean acidification. While these risks are difficult to quantify, the evidence is clear today that they could cause significant risk of catastrophic impacts on societies and ecosystems. Even gradual, non-catastrophic outcomes associated with these threats are likely to result in significant human and economic costs as well as rising ecological losses. Much of the world’s population still suffers from more-immediate local environmental health risks. Indoor and outdoor air pollution continue to bring premature death and illness to millions annually. Water pollution and water-borne illness due to pollution and degradation of watersheds cause similar suffering. 2. Even as human environmental impacts continue to grow in the aggregate, a range of long-term trends are today driving significant decoupling of human well-being from environmental impacts. Decoupling occurs in both relative and absolute terms. Relative decoupling means that human environmental impacts rise at a slower rate than overall economic growth. Thus, for each unit of economic output, less environmental impact (e.g., deforestation, defaunation, pollution) results. Overall impacts may still increase, just at a slower rate than would otherwise be the case. Absolute decoupling occurs when total environmental impacts — impacts in the aggregate — peak and begin to decline, even as the economy continues to grow. Decoupling can be driven by both technological and demographic trends and usually results from a combination of the two. The growth rate of the human population has already peaked. Today’s population growth rate is one percent per year, down from its high point of 2.1 percent in the 1970s. Fertility rates in countries containing more than half of the global population are now below replacement level. Population growth today is primarily driven by longer life spans and lower infant mortality, not by rising fertility rates. Given current trends, it is very possible that the size of the human population will peak this century and then start to decline. Trends in population are inextricably linked to other demographic and economic dynamics. For the first time in human history, over half the global population lives in cities. By 2050, 70 percent are expected to dwell in cities, a number that could rise to 80 percent or more by the century’s end. Cities are characterized by both dense populations and low fertility rates. Cities occupy just 1 to 3 percent of the Earth’s surface and yet are home to nearly four billion people. As such, cities both drive and symbolize the decoupling of humanity from nature, performing far better than rural economies in providing efficiently for material needs while reducing environmental impacts. The growth of cities along with the economic and ecological benefits that come with them are inseparable from improvements in agricultural productivity. As agriculture has become more land and labor efficient, rural populations have left the countryside for the cities. Roughly half the US population worked the land in 1880. Today, less than 2 percent does. As human lives have been liberated from hard agricultural labor, enormous human resources have been freed up for other endeavors. Cities, as people know them today, could not exist without radical changes in farming. In contrast, modernization is not possible in a subsistence agrarian economy. These improvements have resulted not only in lower labor requirements per unit of agricultural output but also in lower land requirements. This is not a new trend: rising harvest yields have for millennia reduced the amount of land required to feed the average person. The average per-capita use of land today is vastly lower than it was 5,000 years ago, despite the fact that modern people enjoy a far richer diet. Thanks to technological improvements in agriculture, during the half-century starting in the mid-1960s, the amount of land required for growing crops and animal feed for the average person declined by one-half. Agricultural intensification, along with the move away from the use of wood as fuel, has allowed many parts of the world to experience net reforestation. About 80 percent of New England is today forested, compared with about 50 percent at the end of the 19th century. Over the past 20 years, the amount of land dedicated to production forest worldwide declined by 50 million hectares, an area the size of France. The “forest transition” from net deforestation to net reforestation seems to be as resilient a feature of development as the demographic transition that reduces human birth rates as poverty declines. Human use of many other resources is similarly peaking. The amount of water needed for the average diet has declined by nearly 25 percent over the past half-century. Nitrogen pollution continues to cause eutrophication and large dead zones in places like the Gulf of Mexico. While the total amount of nitrogen pollution is rising, the amount used per unit of production has declined significantly in developed nations. Indeed, in contradiction to the often-expressed fear of infinite growth colliding with a finite planet, demand for many material goods may be saturating as societies grow wealthier. Meat consumption, for instance, has peaked in many wealthy nations and has shifted away from beef toward protein sources that are less land intensive. As demand for material goods is met, developed economies see higher levels of spending directed to materially less-intensive service and knowledge sectors, which account for an increasing share of economic activity. This dynamic might be even more pronounced in today’s developing economies, which may benefit from being late adopters of resource-efficient technologies. Taken together, these trends mean that the total human impact on the environment, including land-use change, overexploitation, and pollution, can peak and decline this century. By understanding and promoting these emergent processes, humans have the opportunity to re-wild and re-green the Earth — even as developing countries achieve modern living standards, and material poverty ends. 3. The processes of decoupling described above challenge the idea that early human societies lived more lightly on the land than do modern societies. Insofar as past societies had less impact upon the environment, it was because those societies supported vastly smaller populations. In fact, early human populations with much less advanced technologies had far larger individual land footprints than societies have today. Consider that a population of no more than one or two million North Americans hunted most of the continent’s large mammals into extinction in the late Pleistocene, while burning and clearing forests across the continent in the process. Extensive human transformations of the environment continued throughout the Holocene period: as much as three-quarters of all deforestation globally occurred before the Industrial Revolution. The technologies that humankind’s ancestors used to meet their needs supported much lower living standards with much higher per-capita impacts on the environment. Absent a massive human die-off, any large-scale attempt at recoupling human societies to nature using these technologies would result in an unmitigated ecological and human disaster. Ecosystems around the world are threatened today because people over-rely on them: people who depend on firewood and charcoal for fuel cut down and degrade forests; people who eat bush meat for food hunt mammal species to local extirpation. Whether it’s a local indigenous community or a foreign corporation that benefits, it is the continued dependence of humans on natural environments that is the problem for the conservation of nature. Conversely, modern technologies, by using natural ecosystem flows and services more efficiently, offer a real chance of reducing the totality of human impacts on the biosphere. To embrace these technologies is to find paths to a good Anthropocene. The modernization processes that have increasingly liberated humanity from nature are, of course, double-edged, since they have also degraded the natural environment. Fossil fuels, mechanization and manufacturing, synthetic fertilizers and pesticides, electrification and modern transportation and communication technologies, have made larger human populations and greater consumption possible in the first place. Had technologies not improved since the Dark Ages, no doubt the human population would not have grown much either. It is also true that large, increasingly affluent urban populations have placed greater demands upon ecosystems in distant places –– the extraction of natural resources has been globalized. But those same technologies have also made it possible for people to secure food, shelter, heat, light, and mobility through means that are vastly more resource- and land-efficient than at any previous time in human history. Decoupling human well-being from the destruction of nature requires the conscious acceleration of emergent decoupling processes. In some cases, the objective is the development of technological substitutes. Reducing deforestation and indoor air pollution requires the substitution of wood and charcoal with modern energy. In other cases, humanity’s goal should be to use resources more productively. For example, increasing agricultural yields can reduce the conversion of forests and grasslands to farms. Humans should seek to liberate the environment from the economy. Urbanization, agricultural intensification, nuclear power, aquaculture, and desalination are all processes with a demonstrated potential to reduce human demands on the environment, allowing more room for non-human species. Suburbanization, low-yield farming, and many forms of renewable energy production, in contrast, generally require more land and resources and leave less room for nature. These patterns suggest that humans are as likely to spare nature because it is not needed to meet their needs as they are to spare it for explicit aesthetic and spiritual reasons. The parts of the planet that people have not yet profoundly transformed have mostly been spared because they have not yet found an economic use for them — mountains, deserts, boreal forests, and other “marginal” lands. Decoupling raises the possibility that societies might achieve peak human impact without intruding much further on relatively untouched areas. Nature unused is nature spared. 4. Plentiful access to modern energy is an essential prerequisite for human development and for decoupling development from nature. The availability of inexpensive energy allows poor people around the world to stop using forests for fuel. It allows humans to grow more food on less land, thanks to energy-heavy inputs such as fertilizer and tractors. Energy allows humans to recycle waste water and desalinate sea water in order to spare rivers and aquifers. It allows humans to cheaply recycle metal and plastic rather than to mine and refine these minerals. Looking forward, modern energy may allow the capture of carbon from the atmosphere to reduce the accumulated carbon that drives global warming. However, for at least the past three centuries, rising energy production globally has been matched by rising atmospheric concentrations of carbon dioxide. Nations have also been slowly decarbonizing — that is, reducing the carbon intensity of their economies — over that same time period. But they have not been doing so at a rate consistent with keeping cumulative carbon emissions low enough to reliably stay below the international target of less than 2 degrees Centigrade of global warming. Significant climate mitigation, therefore, will require that humans rapidly accelerate existing processes of decarbonization. There remains much confusion, however, as to how this might be accomplished. In developing countries, rising energy consumption is tightly correlated with rising incomes and improving living standards. Although the use of many other material resource inputs such as nitrogen, timber, and land are beginning to peak, the centrality of energy in human development and its many uses as a substitute for material and human resources suggest that energy consumption will continue to rise through much if not all of the 21st century. For that reason, any conflict between climate mitigation and the continuing development process through which billions of people around the world are achieving modern living standards will continue to be resolved resoundingly in favor of the latter. Climate change and other global ecological challenges are not the most important immediate concerns for the majority of the world's people. Nor should they be. A new coal-fired power station in Bangladesh may bring air pollution and rising carbon dioxide emissions but will also save lives. For millions living without light and forced to burn dung to cook their food, electricity and modern fuels, no matter the source, offer a pathway to a better life, even as they also bring new environmental challenges. Meaningful climate mitigation is fundamentally a technological challenge. By this we mean that even dramatic limits to per capita global consumption would be insufficient to achieve significant climate mitigation. Absent profound technological change **there is no credible path to meaningful climate mitigation**. While advocates differ in the particular mix of technologies they favor, we are aware of no quantified climate mitigation scenario in which technological change is not responsible for the vast majority of emissions cuts. The specific technological paths that people might take toward climate mitigation remain deeply contested. Theoretical scenarios for climate mitigation typically reflect their creators’ technological preferences and analytical assumptions while all too often failing to account for the cost, rate, and scale at which low-carbon energy technologies can be deployed. The history of energy transitions, however, suggests that there have been consistent patterns associated with the ways that societies move toward cleaner sources of energy. Substituting higher-quality (i.e., less carbon-intensive, higher-density) fuels for lower-quality (i.e., more carbon-intensive, lower-density) ones is how virtually all societies have decarbonized, and points the way toward accelerated decarbonization in the future. Transitioning to a world powered by zero-carbon energy sources will require energy technologies that are power dense and capable of scaling to many tens of terawatts to power a growing human economy. Most forms of renewable energy are, unfortunately, incapable of doing so. The scale of land use and other environmental impacts necessary to power the world on biofuels or many other renewables are such that we doubt they provide a sound pathway to a zero-carbon low-footprint future. High-efficiency solar cells produced from earth-abundant materials are an exception and have the potential to provide many tens of terawatts on a few percent of the Earth’s surface. Present-day solar technologies will require substantial innovation to meet this standard and the development of cheap energy storage technologies that are capable of dealing with highly variable energy generation at large scales. Nuclear fission today represents the only present-day zero-carbon technology with the demonstrated ability to meet most, if not all, of the energy demands of a modern economy. However, a variety of social, economic, and institutional challenges make deployment of present-day nuclear technologies at scales necessary to achieve significant climate mitigation unlikely. A new generation of nuclear technologies that are safer and cheaper will likely be necessary for nuclear energy to meet its full potential as a critical climate mitigation technology. In the long run, next-generation solar, advanced nuclear fission, and nuclear fusion represent the most plausible pathways toward the joint goals of climate stabilization and radical decoupling of humans from nature. If the history of energy transitions is any guide, however, that transition will take time. During that transition, other energy technologies can provide important social and environmental benefits. Hydroelectric dams, for example, may be a cheap source of low-carbon power for poor nations even though their land and water footprint is relatively large. Fossil fuels with carbon capture and storage can likewise provide substantial environmental benefits over current fossil or biomass energies. The ethical and pragmatic path toward a just and sustainable global energy economy requires that human beings transition as rapidly as possible to energy sources that are cheap, clean, dense, and abundant. Such a path will require sustained public support for the development and deployment of clean energy technologies, both within nations and between them, though international collaboration and competition, and within a broader framework for global modernization and development. 5. We write this document out of deep love and emotional connection to the natural world. By appreciating, exploring, seeking to understand, and cultivating nature, many people get outside themselves. They connect with their deep evolutionary history. Even when people never experience these wild natures directly, they affirm their existence as important for their psychological and spiritual well-being. Humans will always materially depend on nature to some degree. Even if a fully synthetic world were possible, many of us might still choose to continue to live more coupled with nature than human sustenance and technologies require. What decoupling offers is the possibility that humanity’s material dependence upon nature might be less destructive. The case for a more active, conscious, and accelerated decoupling to spare nature draws more on spiritual or aesthetic than on material or utilitarian arguments. Current and future generations could survive and prosper materially on a planet with much less biodiversity and wild nature. But this is not a world we want nor, if humans embrace decoupling processes, need to accept. What we are here calling nature, or even wild nature, encompasses landscapes, seascapes, biomes and ecosystems that have, in more cases than not, been regularly altered by human influences over centuries and millennia. Conservation science, and the concepts of biodiversity, complexity, and indigeneity are useful, but alone cannot determine which landscapes to preserve, or how. In most cases, there is no single baseline prior to human modification to which nature might be returned. For example, efforts to restore landscapes to more closely resemble earlier states (“indigeneity”) may involve removing recently arrived species (“invasives”) and thus require a net reduction in local biodiversity. In other circumstances, communities may decide to sacrifice indigeneity for novelty and biodiversity. Explicit efforts to preserve landscapes for their non-utilitarian value are inevitably anthropogenic choices. For this reason, all conservation efforts are fundamentally anthropogenic. The setting aside of wild nature is no less a human choice, in service of human preferences, than bulldozing it. Humans will save wild places and landscapes by convincing our fellow citizens that these places, and the creatures that occupy them, are worth protecting. People may choose to have some services — like water purification and flood protection — provided for by natural systems, such as forested watersheds, reefs, marshes, and wetlands, even if those natural systems are more expensive than simply building water treatment plants, seawalls, and levees. There will be no one-size-fits-all solution. Environments will be shaped by different local, historical, and cultural preferences. While we believe that agricultural intensification for land-sparing is key to protecting wild nature, we recognize that many communities will continue to opt for land-sharing, seeking to conserve wildlife within agricultural landscapes, for example, rather than allowing it to revert to wild nature in the form of grasslands, scrub, and forests. Where decoupling reduces pressure on landscapes and ecosystems to meet basic human needs, landowners, communities, and governments still must decide to what aesthetic or economic purpose they wish to dedicate those lands. Accelerated decoupling alone will not be enough to ensure more wild nature. There must still be a conservation politics and a wilderness movement to demand more wild nature for aesthetic and spiritual reasons. Along with decoupling humankind’s material needs from nature, establishing an enduring commitment to preserve wilderness, biodiversity, and a mosaic of beautiful landscapes will require a deeper emotional connection to them. 6. We affirm the need and human capacity for accelerated, active, and conscious decoupling. Technological progress is not inevitable. Decoupling environmental impacts from economic outputs is not simply a function of market-driven innovation and efficient response to scarcity. The long arc of human transformation of natural environments through technologies began well before there existed anything resembling a market or a price signal. Thanks to rising demand, scarcity, inspiration, and serendipity, humans have remade the world for millennia. Technological solutions to environmental problems must also be considered within a broader social, economic, and political context. We think it is counterproductive for nations like Germany and Japan, and states like California, to shutter nuclear power plants, recarbonize their energy sectors, and recouple their economies to fossil fuels and biomass. However, such examples underscore clearly that technological choices will not be determined by remote international bodies but rather by national and local institutions and cultures. Too often, modernization is conflated, both by its defenders and critics, with capitalism, corporate power, and laissez-faire economic policies. We reject such reductions. What we refer to when we speak of modernization is the long-term evolution of social, economic, political, and technological arrangements in human societies toward vastly improved material well-being, public health, resource productivity, economic integration, shared infrastructure, and personal freedom. Modernization has liberated ever more people from lives of poverty and hard agricultural labor, women from chattel status, children and ethnic minorities from oppression, and societies from capricious and arbitrary governance. Greater resource productivity associated with modern socio-technological systems has allowed human societies to meet human needs with fewer resource inputs and less impact on the environment. More-productive economies are wealthier economies, capable of better meeting human needs while committing more of their economic surplus to non-economic amenities, including better human health, greater human freedom and opportunity, arts, culture, and the conservation of nature. Modernizing processes are far from complete, even in advanced developed economies. Material consumption has only just begun to peak in the wealthiest societies. Decoupling of human welfare from environmental impacts will require a sustained commitment to technological progress and the continuing evolution of social, economic, and political institutions alongside those changes. Accelerated technological progress will require the active, assertive, and aggressive participation of private sector entrepreneurs, markets, civil society, and the state. While we reject the planning fallacy of the 1950s, we continue to embrace a strong public role in addressing environmental problems and accelerating technological innovation, including research to develop better technologies, subsidies, and other measures to help bring them to market, and regulations to mitigate environmental hazards. And international collaboration on technological innovation and technology transfer is essential in the areas of agriculture and energy.