1. Subs

1. T - China will respond by creating an SSBN bastion in the South China Sea.

Tong **Zhao 20**. Fellow in Carnegie's Nuclear Policy Program based at the Carnegie–Tsinghua Center for Global Policy. "Modernizing Without Destabilizing: China's Nuclear Posture in a New Era." https://carnegieendowment.org/2020/08/25/modernizing-without-destabilizing-china-s-nuclear-posture-in-new-era-pub-82454#:~:text=Before%20China%20deployed%20strategic%20nuclear,United%20States%20may%20increase%20considerably.

First, the **U**nited **S**tates and China have **no mutual understanding** of how to incorporate China's new sea-based nuclear capability into the bilateral strategic stability relationship. Through the 2010 Nuclear Posture Review Report and Ballistic Missile Defense Review Report, the Obama administration made commitments to maintaining strategic stability with China. In theory, this means the United States will not deliberately seek to undermine China's nuclear retaliation capability. Many American and Chinese experts agree that maintaining a relationship of mutual vulnerability should be **tacitly accepted** as the starting point for discussing broader strategic security issues like missile defense and conventional hypersonic weapons. This mutual understanding, however, does not seem to have been **extend**ed to cover the **underwater domain**. The U.S. Navy, trained during the Cold War to keep enemy SSBNs in the crosshairs, views China's emerging strategic nuclear submarine fleet as a **new threat** and has taken measures to develop a counter-capability. Together with allies in the region, the United States has deployed an increasing number of advanced anti-submarine maritime aircraft and nuclear attack submarines to military bases close to China. There are also new research and development programs that seek to use new technologies such as unmanned underwater vehicles to track and trail Chinese submarines.12 Such tracking and trailing of Chinese nuclear submarines would be necessary if the U.S. Navy wanted to be able to sink them when needed. There is no doubt that China sees such behavior as **highly threatening**. Technical and geographical factors further restrain China's strategic nuclear submarine operations. Current Chinese SSBNs may not be sufficiently quiet to escape enemy detection in the deep sea. As a result, they may have to be deployed primarily in **coastal waters** in the near term, where the shallow water and noise created by busy shipping traffic can help conceal otherwise noisy submarines. To implement this deployment strategy, China may need to follow the Soviet example of creating a so-called **submarine bastion** in a certain area of its coastal water. This requires the deployment of substantial anti-submarine warfare (**ASW**) and general-purpose naval capabilities to sanitize a body of water and **make it safe for SSBNs** to conduct patrols. This type of operation would be **very resource-intensive**: during the Cold War, the Soviet Navy devoted a very large portion of its entire assets to protecting its SSBNs. But this is not the most challenging part of the mission. If the **U**nited **S**tates seeks to challenge China's SSBNs, the risk of a conventional military confrontation would **rise considerably**. This is the most challenging part of China's SSBN operations. Due to geographical constraints, China may have to deploy most of its **SSBNs in the S**outh **C**hina **S**ea and may need to create an **SSBN bastion** within part of that sea. Doing so would be particularly difficult in the South China Sea because of its busy international shipping traffic and the presence of multiple countries' naval vessels that make frequent transit within the sea. The United States, with its long-standing commitment to freedom of navigation, is unlikely to stop challenging China's efforts to keep foreign military vessels out of parts of the South China Sea. As China increases its nuclear submarine operations there, we have already seen several **dangerous encounters** between U.S. anti-submarine platforms and the Chinese military.13 Therefore, even though China's deployment of strategic nuclear submarines is solely intended to strengthen its nuclear deterrent and has little conventional military utility, it could have significant implications for **military tensions** and **stability** at the conventional level. This problem will continue to exist and even grow if the two countries cannot reach a mutual understanding on the implications of China's SSBN patrols and on how the United States should react to these Chinese operations.

That guarantees war. The bastion will be perceived as a territorial grab.

Tong **Zhao 18**. Fellow in Carnegie's Nuclear Policy Program based at the Carnegie–Tsinghua Center for Global Policy. "Tides of Change: China's Nuclear Ballistic Missile Submarines and Strategic Stability." https://carnegietsinghua.org/2018/10/24/tides-of-change-china-s-nuclear-ballistic-missile-submarines-and-strategic-stability-pub-77490.

BASTION STRATEGY AND SEA CONTROL For China, establishing an SSBN bastion in the fiercely contested waters of the South China Sea would require a requisite degree of **sea control**; apart from improvements to and growth in the country's SSBN fleet, achieving this task will impose high demands on the PLA's supporting capabilities. Moreover, the deployment and employment of such supporting capabilities could create additional **escalation risks**. The history of U.S. and Soviet naval encounters during the Cold War offers reason for **caution**. In the 1980s, after the Soviet Union withdrew its SSBNs to bastions in coastal areas, the U.S. Navy followed them in an effort to keep holding the submarines at risk. In response, Moscow took pains to strengthen the bastions and protect its SSBNs. Dangerous confrontations between Soviet and U.S. forces took place continually during this period.1 Because of China's less favorable maritime environment, Beijing will face even greater **challenges** today establishing an **SSBN bastion** than Moscow did during the Cold War. The Soviet Union had the luxury of building SSBN bastions in relatively isolated coastal waters. The Kara Sea and the Sea of Okhotsk are far enough from any other countries that functionally they could almost be considered Soviet waters. By comparison, the South China Sea is anything but **isolated**. It contains the world's **most important** trade routes, carries about one-third of **global shipping** volumes, and provides passage to about **half** of the world's merchant ships.2 Moreover, the **S**outh **C**hina **S**ea is surrounded by **several countries**, many of which claim **sovereignty** over overlapping parts of it and exercise actual control over different land features. Clashes over fishing rights, oil resources, and sovereignty break out **frequently**. From a military perspective, the presence of naval vessels from multiple surrounding countries makes the South China Sea potentially **crowded**. States from outside the immediate region—particularly Japan, South Korea, and the United States—also have **important interests** there, including the protection of **trade routes**. These countries, therefore, operate their navies in the vicinity from time to time as well. So far, instead of pursuing a measure of sea control, Beijing has prioritized efforts to improve its **sea-denial capability**—that is, the ability to make some of its coastal waters unsafe for enemy ships to operate in. China has developed so-called **A2/AD weapons** for this purpose. For example, Beijing designed the DF-21D and DF-26 ballistic missiles to strike large surface ships and so deter such ships from operating close to the Chinese coast. Such capabilities can help prevent external powers from militarily infringing on China's core national security interests, including in any future conflict over **Taiwan**. But establishing an SSBN bastion is much more demanding than simply making a body of water unsafe for an enemy's ships; this task would require China to make a body of water safe only for its own submarines and ships. Foreign ASW-capable platforms—including surface ships, submarines, and aircraft—would need to be repelled from the area when necessary. China will not find it easy to obtain such sea control. The United States would be highly unlikely to willingly cede to China the power to control parts of the South China Sea. On the contrary, given the increasing tensions resulting from maritime territorial disputes in the region, Washington has started to dispatch regular flotillas to the South China Sea to conduct freedom of navigation operations (FONOPs) to assert what the United States sees as its rights. Upholding the principle of freedom of navigation is now a U.S. priority in the South China Sea. In June 2016 alone, for example, two U.S. carrier strike groups transited the South China Sea to conduct FONOP-related operations.3 An added motivation for the United States and other regional countries to prevent any single state from unilaterally controlling part of the sea and **denying access** to others is the July 2016 verdict of the Permanent Court of Arbitration in The Hague that challenged the legitimacy of China's nine-dash-line-based territorial claims in the South China Sea. Since taking office, the Trump administration has continued to conduct FONOPs, following a short break, and senior U.S. officials have reaffirmed their determination to continue and further enhance such activities.4 In addition to its commitment to freedom of navigation, the United States is quickly enhancing its ASW capabilities in the region. Washington sees the gradual improvement of China's submarine forces—including its **SSBNs**, SSNs, and advanced diesel-electric submarines—as a **major security threat**. Despite the technical inferiority of individual Chinese submarines compared to U.S. ones, the United States is concerned that China's overall submarine fleet is apparently already larger than its own and that this gap may continue to grow.5 Notably, the United States already deploys 60 percent of its entire submarine fleet to the Pacific, and the U.S. military continues to deploy more maritime assets from other theaters to the Asia Pacific region.6 For instance, the former commander of U.S. Pacific Command, retired Admiral Harry Harris Jr., testified to Congress in 2016 that more SSNs are needed in the region to counter Chinese naval forces.7 Since the days of the Obama administration, Washington has increased the tempo of operations in the South China Sea involving advanced surface ships, many of which are equipped with cutting-edge ASW capabilities. With U.S. allies opening their military bases and airspace, the United States has deployed its most advanced anti-submarine aircraft around the South China Sea. To supplement older P3-C Orion aircraft, which have long operated in the region (including for ASW purposes), Washington has deployed much newer P8-A Poseidon aircraft to Okinawa, Japan; the Philippines; and Singapore. Malaysia has reportedly agreed to host such aircraft in the future.8 Additional states, including Australia, have purchased P8-A aircraft with the expectation that they can play a role in countering China's growing submarine threat. Looking ahead, the competition is only getting **more intense**.

IMPLICATIONS FOR **CRISIS STABILITY** Some overseas analysts have interpreted steps that the Chinese military appears to be taking to track other countries' naval vessels operating in the **S**outh **C**hina **S**ea to have exacerbated **escalation risks**. Following the reported establishment of the Maritime Navigation Identification Zone in the South China Sea,9 the deputy chief of staff of the PLA Navy, Rear Admiral Wang Weiming, claimed in 2017 that the Chinese military "will track every military vessel and will intercept every aircraft within the scope of their responsibilities."10 This declaration has raised concerns in other countries that, if implemented, such a policy could increase the **risks of** a peacetime incident leading to a conventional military **conflict**.11 Any steps China takes to purge from some part of the South China Sea all non-Chinese ASW platforms would encounter **significant challenges**. In particular, serious military confrontations could **break out**, as earlier Chinese efforts to interfere with foreign ASW-related operations in the South China Sea demonstrate. In the past few years, China has frequently scrambled fighter jets to intercept U.S. maritime aircraft, such as P8-As, over areas not far from the Hainan submarine base. In some of these cases, Chinese pilots have made aerobatic maneuvers very close to U.S. aircraft to stop them from conducting surveillance, which Beijing believes was sometimes directed against SSBNs hiding underwater. Some of these interceptions were so dangerous that the United States repeatedly protested them, further straining the U.S.-China military relationship.12 As China starts to deploy its SSBNs from Hainan, dangerous encounters may become **more frequent**. In a future hypothetical crisis, if China follows the U.S. doctrine of attempting to preemptively destroy enemy airfields to prevent anti-submarine aircraft from taking off in the first place, even more serious risks of **rapid escalation** could result.13 Aside from its surveillance aircraft, the United States sometimes dispatches surface ships to the South China Sea to map the seafloor and collect hydrographic measurements. These activities, especially if conducted near Chinese SSBN bases, can spark incidents. In May 2009, for example, Chinese maritime militia ships harassed the U.S. Navy's Impeccable by trying to prevent it from conducting surveillance and attempting to snag its acoustic equipment in the water. In response, the Impeccable's crew shot their water cannon at the Chinese vessels.14 Potential escalation risks could **extend to land** as well. In the future, China may follow the Russian practice of deploying more and higher-quality land-based anti-ship **cruise missiles**, as well as its unique **anti-ship ballistic missiles**, along the coast to protect Chinese SSBNs by repelling enemy ASW-capable surface ships.15 According to the U.S. Joint Concept for Access and Maneuver in the Global Commons (JAM-GC), a U.S. military concept that succeeded Air-Sea Battle, Chinese anti-ship missiles are a key component of China's A2/AD capability and might be preemptively attacked in a regional conflict to protect all large U.S. surface combatants. Yet, regardless of U.S. intent, China might interpret the loss of its anti-ship missiles at the beginning of a **hypothetical conventional conflict** as linked to a U.S. effort to undermine the **survivability** of its SSBNs. Furthermore, the underwater measures China might take to reduce the threat posed by enemy SSNs could be seen by others as provocative and potentially increase the risk of incidents. In February 2017, the Legislative Affairs Office of the State Council started to seek public comments on a revised draft of the Maritime Traffic Safety Law of the People's Republic of China. This revised draft stipulates that, when in Chinese territorial waters, foreign submarines need to stay surfaced, show their national flag, and report to China's maritime administrative agencies.16 There is concern that this new law, if passed, might have implications for foreign submarine activity in major parts of the South China Sea—especially given that China has not clarified over which parts of the South China Sea it claims sovereign rights.17 A further concern is that Chinese efforts to enforce any new rules by, for example, attempting to repel foreign ASW platforms, could **precipitate confrontations**.

2. T - Subs are bad -- redundant, expensive and make nuclear war inevitable.

Montgomery and Reif 21 (Monica is a Research Analyst for the Center for Arms Control and Non-Proliferation. Kingston is the Director for Disarmament and Threat Reduction Policy at the Arms Control Association. "Biden Should Sink This Proposed Nuclear Weapon; None of the arguments for the nuclear-armed sea-launched cruise missile hold water." 4/19/21 https://www.defenseone.com/ideas/2021/04/biden-should-sink-new-nuclear-weapon/173473/)//conway

President Joe Biden's first real test of to reducing the role of nuclear weapons in U.S. national security strategy and trimming the bloated nuclear weapons budget is imminent. The administration an initial topline version of its first national defense budget request on April 9 and is expected to release the full request in May or June. While a number of unnecessary and costly nuclear weapons programs by the administration, one program stands out for immediate cancellation: the Trump administration's proposal for a new nuclear-armed sea-launched cruise missile. Abandoning development of this new nuclear weapon should be an easy choice. Biden the missile during his campaign for president and for good reason. The weapon would be a redundant and dangerous multi-billion-dollar mistake. Three decades have passed since the United States last deployed nuclear cruise missiles at sea. President George H.W. Bush directed the nuclear Tomahawk Land Attack Missile to be taken off patrol in 1991 at the end of the

Cold War. The weapons remained in storage in Washington state until the Obama administration identified them as a redundant capability in its and ordered their retirement. To resurrecting the capability and deploying it on attack submarines or surface ships within a decade, the Trump administration pointed to a in the U.S. arsenal of more usable low-yield (or). In addition, the administration argued that the missile could help convince Russia to negotiate more seriously about limiting its non-strategic weapons. The administration also said that the weapon would strengthen the credibility of tailored deterrent options in the Indo-Pacific region in the face of a more aggressive China. But these arguments are unconvincing. While Russia certainly possesses far more non-strategic warheads than the United States, the Trump administration that Moscow believes Washington would be deterred from responding to Russian aggression due to "an asymmetry of [nuclear] yields." Moreover, Russia has its stockpile of non-strategic nuclear arsenal by one to three thousand warheads over the past decade, according to official U.S. government and expert assessments. Regardless, the United States already deploys more than enough including the air-delivered B61 gravity bomb and air-launched cruise missile, as well as the new low-yield submarine-launched ballistic missile warhead fielded by the Trump administration. The Pentagon and the Energy Department's semiautonomous National Nuclear Security Administration have spent billions of dollars – and are scores of billions more – to upgrade these weapons in the years ahead to ensure that they can defeat advancing adversary defenses. Furthermore, a new sea-launched cruise missile would detract from the higher-priority conventional missions of the Navy and increase the possibility of conflict escalation through miscalculation. Arming the surface or attack submarine fleets with nuclear cruise missiles would reduce the number of conventional missiles each boat could carry at a time when the Pentagon that the "erosion of conventional deterrence" is the greatest threat posed by China in the Indo-Pacific. To make matters worse, the service would face significant operational burdens associated with re-nuclearizing the vessels. Mixing conventional and nuclear cruise missiles would also decrease the value of the conventional missiles – as any launch of a conventional missile would inherently send a nuclear signal – and increase the potential for unintended nuclear use in a conflict with a nuclear-armed adversary – since the adversary would have no way of knowing if the missile was nuclear or conventional. Nor is bringing back a nuclear sea-launched cruise missile likely to be an effective arms control bargaining chip. A of U.S.-Russian arms control raises doubts about the strength of the link between increased U.S. spending on nuclear weapons and arms control success. But even if the weapon were a useful chip, it's not slated to be fielded until the end of the decade. And Russia that its willingness to put non-strategic nuclear weapons on the negotiating table will depend on the U.S. willingness to put non-nuclear capabilities such as ballistic missile defense on the table in return. Development of the sea-launched cruise missile has not yet begun, and only a tiny fraction of the large projected total cost has been expended thus far. To date, around $12 million has been provided for initiation studies on the weapon, a small drop in the bucket compared to the in projected acquisition spending over the next decade on the missiles and its associated warhead. Additional funds, likely several billion dollars, would also be required to recertify ships or submarines to carry the weapons and to operate and sustain them. Unless the Biden administration reverses course, the Navy is to request preliminary funding for the cruise missile in fiscal year 2022. The administration's topline request indicated general support for ongoing nuclear modernization programs pending the outcome of a more detailed nuclear policy review, but specific funding levels for individual programs has yet to be divulged. Biden should make good on this campaign promise by canceling or deferring the nuclear sea-launched cruise missile before it begins. If he does so, he should anticipate a strong base of , where the reality of flat defense budgets and emphasis on upgrading the Navy's conventional fleet and addressing other pressing security needs make for a powerful case against this unnecessary weapon.

2. Space

Imp. T - Space cololization bad.

Ryan **Gunderson** et al. September 20**21**, [Ryan Gunderson, Diana Stuart, and Brian Petersen, * Assistant Professor of Sociology and Social Justice Studies in the Department of Sociology and Gerontology at Miami University, ** Assistant Professor in the Sustainable Communities Program and in the School of Earth Sciences and Environmental Sustainability at Northern Arizona University, *** Assistant Professor in the Department of Geography, Planning, and Recreation at Northern Arizona University, "In search of plan(et) B: Irrational rationality, capitalist realism, and space colonization," 2021, Future, Vol. 134, https://doi.org/10.1016/j.futures.2021.102857, EA & -zc-]

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4.1. The irrational rationality of space colonization

While there are incredible challenges that could potentially limit visions of space colonization, our focus is to examine if space colonization is rational in terms of preserving the human species from the escalating existential threats on Earth. From what we know, does space colonization represent an effective and efficient way to protect the human species? How rational are the justifications for space colonization to save the human species on their own instrumental grounds? We argue the following: (1) that **alternatives** to Earth are obviously **far more inhospitable** for human life than Earth and, thus, preserving Earth is more instrumentally rational; (2) if the goal of space colonization is to preserve the human species, then it is **more** instrumentally **rational to** save many **more lives on Earth** than create space colonies for a small population who can afford the ticket; and, most importantly, (3) there is reason to predict that **humans** would **take** an **irrational** rational **logic with them** to space, the same rationality **that oversaw the destruction** of Earth and brought them off-planet in the first place. The point is to develop an immanent critique of the instrumental case for space colonization to show the extent to which this form of logic is still unreasonable, even judged by its own means-oriented criteria.

While space colonization is justified to avoid risks and threats on Earth, **there will be new risks** and threats in space – some that are even **more severe.** Kovic (2020) discusses some of these risks and in certain scenarios the **risks** of space travel and colonization **greatly outweigh the risks of staying on Earth and the benefits of colonizing space**. Kovic (2020): 3) explains,

[i]n general, there are two ways in which space colonization-related risks might affect the long-term future of humankind. First, humankind might become more susceptible to existing (existential) risks**.** Second, space colonization itself might create new (existential) risks that could result in highly undesirable or even catastrophic outcomes.

Kovic (2020) in the end argues that prioritizing space colonization as a survival strategy overlooks or ignores the high probability of existential threats and risks in space. The **rapid creation of new technologies for space living may also create unexpected consequences and risks that could undermine or threaten space colonization.** For example, on Mars, hostile conditions including dust storms, sub-freezing night time temperatures, and lack of water or carbon-dioxide to grow plants (Szocik, Wójtowicz, Rappaport, & Corbally, 2020) could result in death, starvation, cannibalism and extremely stressful survival decisions causing "astronomical amounts" of suffering (Torres, 2018: 75).

In addition, the space colonies currently proposed still would not protect humans from large-scale stellular events like supernovae or an expansion of the sun. As explained by Stoner (2017) in the context of a Mars colony, the same risks as well as new risks make the colony very dangerous and protective measures would be immensely expensive in a cost-benefit analysis:

[i]f the goal is species survival, and given that the Martian environment is much less survivable than even a post-strike Earth would be, then there is no remotely realistic budget point at which the marginal dollar would be more effectively spent on Mars colonization than on protecting Earth and the creatures and civilizations that evolved to live within its shelters.

Stoner (2017) goes on to argue that the analysis for the operations of projects like those of SpaceX, "only appears rational because they have carefully loaded the comparison scenarios in a way that guarantees a pro-colonization conclusion." While space colonization may be a better preservation strategy than doing nothing, **there are many more options that are less risky and more likely to preserve a greater number of human lives.**

Another commonly overlooked aspect of space colonization as a species survival strategy is the fact that **not everyone will be able to go**, and many of Earth's commoners and poor will likely be left on Earth. Only a portion of the human population would be able to live off-planet, perhaps only the economic elite. It is not unreasonable to assume that,. if there are large inequalities in power and wealth, that the most wealthy will be in power and that these elites will decide to be the "lucky" few space settlers. It is not possible for Mars, for example, to provide a safe habitat for all humans on Earth. Thus, a possible scenario is economic elites leaving behind the vast majority of humans on an inhospitable Earth. As Billings (2019: 45) questions, "how many poverty-stricken Bangladeshis, how many sub-Saharan Africans, how many permanently displaced Syrian refugees, how many disabled and unemployable workers could come up with $200,000 – or $2,000,000 for that matter – to move to another planet and start a new life. What are the ethics of giving the rich yet another advantage over the poor? What are the ethics of ignoring the need to check the rapid pace of climate change on our own planet?"

Under capitalism, any solution to crises on Earth focused on moving off-planet will likely exclude the masses and the poor. Are these lives not worth saving? Are there **other strategies** that **would save more lives**?

Saving the most present and future human lives would require addressing the threats on Earth, including climate change, biodiversity loss, poverty, disease, and famine. As stated by Kovic (2020: 6), "[g]iven these acute problems, pursuing space colonization today could be a misguided use of limited resources." He poses the following question: If the goal is to save as many lives and to maximize overall wellbeing, then why focus on an alternative that only benefits a very small population, while the vast majority struggle to survive or perish? Others argue that much more than human lives need to be saved to live successfully off-planet; we need a diversity of other organisms and a measurable portion of the Earth's biodiversity (Johnson, 2019). Given the **rate of existential threats** like climate change, **how much time is there** to develop this technology and transport all people and enough other organisms off-planet? If the goal is species survival, the **time** (**and** the immense **resources** required) **could be spent in more effective ways** to benefit all people and species. However, these alternatives are unseen or considered impossible in the context of capitalist realism (see proceeding section).

Lastly, the current social order dominating human-human and human-material relations (**capitalism**) is **likely to result in negative outcomes and problems even off-planet.** For example, mining and development on Mars would very likely be environmentally destructive as colonization is unlikely to have a light impact on the planet (Stoner, 2017). We would bring these relations and the associated problems with us. As Marino (2019: 15) explains,

[i]n Musk's view we need a back-up planet. But he doesn't acknowledge that **we** ourselves **are the cause** of this dire situation. And therein lies the problem and the reason we, as a species, have no business trying to colonize another planet. Musk's reason for wanting to colonize Mars is to save ourselves from ourselves and it is self-evident that this alone recommends we should not be going anywhere.

There is no reason to assume that we have learned our lesson on Earth and will create a new civilization with better outcomes, when the same system and drivers (namely, capital accumulation) continue to dominate the social order.

Billings (2019) reminds us that while one may wish to "start fresh" in a new colony, **humans will take the drivers of crises and collapse with them.** These drivers and forms of logic are precisely why humans find themselves discussing the possibility of moving off-planet in the first place. This fact should inspire collective reflection and deliberative discussions on the purpose of life and **alternative** ways of organizing social relations to achieve this purpose. However, for irrational rationality, the latter substantive questions answered through communicative action are an irrelevant waste of time - at best, "mere opinion." In contrast, the ostensibly "practical" and "realistic" technological rationality responds by designing ever-more sophisticated technics for the irrationally rational purpose of rushing off to space to continue the instrumental crusade of blind domination. This is the elevation of means to ends, the irony of contemporary instrumental reason diagnosed by the Frankfurt School. Rather than serving a better world, technological development and production today are ends to be pursued for their own sake. That is, because we can no longer set aims through reasonable criteria, we pursue aims, such as economic growth and technological development, that are set by a semi-autonomous economic system. For the Frankfurt School, these are irrational conditions because **technology and economic activity should be instruments to serve humanity, rather than humanity serving technology and economic activity.**

In summary, the **associated risks, inequities, and costs do not support the argument that space colonization is an effective and efficient strategy to preserve the species from existential threats on Earth.** The polemical point here is to highlight how the heights of instrumental rationality—hi-tech plans to colonize space to ensure species survival—are irrational because the case for space colonization: (1) fails to make a convincing instrumental case on its own grounds (i.e., space colonization is not an efficient and effective means to safeguard the species) and, (2) by elevating means (namely economic activity) to ends, exhibits the same kind of logic that caused the Earth-bound problems that space colonization is responding to. The inversion of means and ends is examined further in the context of capitalist realism.

NU - Investment now.

Cassauwers '24 [Tom; Freelance Journalist; February 29; Al Jazeera; "Is nuclear power the key to space exploration?," https://www.aljazeera.com/economy/2024/2/29/is-nuclear-power-the-key-to-space-exploration; DOA: 3-27-2025] tristan

Long a controversial energy source, nuclear has been experiencing renewed interest on Earth to power our fight against climate change. But behind the scenes, nuclear has also been facing a renaissance in space.

In July, the US National Aeronautics and Space Administration (NASA) and Defense Advanced Research Projects Agency (DARPA) jointly announced that they plan to launch a nuclear-propelled spacecraft by 2025 or 2026. The European Space Agency (ESA) in turn is funding a range of studies on the use of nuclear engines for space exploration. And last year, NASA awarded a contract to Westinghouse to develop a concept for a nuclear reactor to power a future moon base.

"There's a lot of interest in nuclear for space applications at the moment," said Dr Ramy Mesalam, programme director of spacecraft engineering at the University of Leicester. "The deeper we explore our solar system and beyond, the more attractive nuclear will become."

NU - Other countries and competition solve---creates the incentive to invest and develop.

Houser '24 [Kristin; Manager @ Freethink; April 1; Freethink; "China is one step closer to having a nuclear-powered spacecraft," https://www.freethink.com/space/nuclear-powered-spacecraft; DOA: 3-27-2025] tristan

Space race: In 2023, DARPA contracted Lockhead Martin to develop a nuclear-powered spacecraft, with the goal of having it ready for an in-space demo by 2027. Russia, meanwhile, announced in 2021 that it will have one ready for its first mission in 2030.

Now, researchers in China have reported that a nuclear reactor they're developing for the Chinese space industry has passed some initial ground tests.

According to their paper, published in the Chinese Academy of Sciences' peer-reviewed journal Scientia Sinica Technologica, they've designed a 1.5 megawatt reactor that can be folded into a package small and light enough to be delivered into space via a traditional chemical rocket.

Nuclear is the worst choice.

Engheim '19 [Erik Engheim, writer, conference speaker, video course author and software developer. 11-10-2019, "Why a Nuclear Powered Rocket is a Bad Idea", Medium, https://erik-engheim.medium.com/why-a-nuclear-powered-rocket-is-a-bad-idea-52b51f4d2c9c, doa 3-27-2025] //ALuo

Chemical rockets may be inefficient but they are **flexible**: You can relatively **easily refuel** in orbit. Feedstock to produce rocket fuel can be obtained a multitude of place: on asteroids, on the moon and on Mars. You can easily start and stop a chemical rocket, which makes them safer and more flexible to operate. Got a problem, just turn off the turbo-pump. The fuel can usually be handled by humans without too big concern for toxicity and pollution. Nuclear rocket engines are **the opposite**. Loading up with new fuel is going to be a **complicated operation**. Obtain nuclear fuel on asteroid, the Moon or Mars? Forget about it! That is going to be far into the future before we can do that effectively. With chemical rockets there is an **opportunity to** start building **space infrastructure** for **manufacturing of fuel**. This could be in orbit with material obtained from **asteroids** as well as on the **moon** or **Mars**. With a nuclear powered space future, we **kill the incentive** to start **building up** such an **industry**. This is unfortunate because it is exactly the kind of training wheels we need. The first **stepping stones** before we begin more advance manufacturing in space. **Nuclear engines** will **forever tie us to** using a **sophisticated industrial based** located on **earth**. But the future of **space exploration** is in establishing based outside of earth and being building up a **self sufficient industry**. When you start building up an industrial society from scratch it would be **madness** to base it off **nuclear power**. You are several months of travel away from a sophisticated industrial base on earth. You are **not going to have sophisticated tools,** **machines and nuclear physicists on site.** You need simple robust technology which you have some measure of hope of being able to maintain and fix without too specialized knowledge and advance tools.

Colonization fails – Time, conflict, health dependence.

Deudney '20 [Daniel; Associate Professor of Political Science @ Johns Hopkins University, PhD in Political Science from Princeton University, MPA from George Washington University; "Dark Skies: Space Expansionism, Planetary Geopolitics, and the Ends of Humanity," https://dokumen.pub/dark-skies-space-expansionism-planetary-geopolitics-and-the-ends-of-humanity-0190903341-9780190903343.html; DOA: 3-27-2025] tristan

A crucial additional parameter of this scenario is temporal: How much time will be required to realize these steps? Optimistic expansion timetables presuppose large and sustained investments in space, which are unlikely. 5 But it seems plausible that these steps might be accomplished over several centuries. However, this schedule assumes that the Earth will be willing and able to provide significant initial support for colonization. The question of how rapidly self-sufficient colonies could be established has direct implications for their ability to serve as hedges to terrestrial catastrophic and existential threats.

Based on the earlier analysis of technological feasibility, the solar expansion success scenario is probably possible, with critical uncertainties about health and artificial biospheres. But this scenario is also very improbable for many strong reasons. Inaction, failure, or debilitating conflict are more likely than success. Colonization may not be attempted because it is too difficult and expensive, or because of growing Earth problems and troubles. Off-Earth living could be too unhealthy for humans, and reproduction and child growth in low-gravity environments may be infeasible, confining viable habitat to spinable artificial bodies. Potent pathogens might evolve in novel space environments. Artificial ecosystems could be too difficult to create and sustain. People may not want to live on Mars or an asteroid, for the same reasons they do not live in the middle of the Sahara or Antarctica. Or colonization might be attempted and quickly fail, like Norse Vineland in Newfoundland or Scot Darien in Panama. Or a colony might be only minimally successful and linger as a remote, climate-stunted backwater, like early modern Iceland. Space colonies might be like the many failed societies analyzed by the geographer Jared Diamond in Collapse. 6 The small population of a space settlement might succumb to disease or debilitating internecine conflict. Conflicts over the limited number of metal-bearing asteroids might start early. 7 The sponsoring Earth agent might abandon its colony due to shifting priorities, insufficient resources, or diverting conflicts. If interstate rivalry propels colonization it will happen more rapidly but will also be more likely to involve violence sooner. If rivalrous states establish colonies, conflict between them might beggar and hobble all. There may be a vast gap between a colony that can be kept operational with continual inputs from Earth and one that is capable of persisting without any Earth support. If, as Sagan proposed, large-scale settlement is delayed until after major terrestrial problems have been solved, the prospects for success rise, while the rationales weaken and the time frames lengthen. And as colonization becomes imminent, doubts of the sort voiced here may lead to organized opposition. The success scenario, and much of space expansionist thinking, operates with the implicit assumption that space settlement will be propelled by numerous capable agents committed to advancing the long-term success of humanity. This is a dubious assumption, given that the Earth's growing problems have yet to stimulate the emergence of numerous powerful agents committed to advancing even the species' short-term success. And if powerful actors were motivated by long-term species interest, colonization would be much less necessary. The success scenario also assumes that different space ventures build on each other when they The success scenario also operates with what can be called the Benign Parent Model of Terra-Colony Relations. In this approach, Earth lavishes resources on its space colonial offspring and benignly supervises their development until they are able to direct and support themselves. Constitutions for space polities embodying the best of Terran political wisdom are established. This model, however, is almost entirely at variance with the historical experience of terrestrial colonization and the incentives of relevant self-interested actors. To the extent states or corporations invest in space colonies, they will want to maintain control and reap the benefits of their investments. To the extent they anticipate colonial independence, they will not invest; if they do, they will try to keep colonies small and dependent. The success scenario also assumes that different space ventures build on each other when they might subvert and impede one another. The two central projects, Mars colonization and asteroidal resource extraction, might be quite antagonistic. Wealth generated from space resources will most probably be repatriated to Earth, not plowed into space habitat construction. Asteroidal exploitation is likely to be capital- and robot-intensive, with a minimal human labor force rotating through small off-world bases, as on off-shore oil rigs. If resources from asteroids are the bonanza some anticipate, the beneficiaries of this wealth will not want colonies to contest their access and possession and can be expected to actively oppose colonization. The more space mining benefits terrestrial actors, the greater their incentive to impede space settlements. And once the bombardment potential of asteroidal orbital alteration technology becomes obvious, the dangers of independent space colonies might be sufficiently obvious to thwart their realization. A long list of powerful barriers stand between colonization visions and accomplishment. Given the many obstacles that render successful space colonization at scale very improbable, it is extremely imprudent for humanity to view space colonization as a hedge against catastrophe or extinction. With low probabilities of success and significant moral hazards and opportunity costs, space colonization should not be considered a viable response to severe Earth problems and troubles.

It won’t work.

Levchenko et al. **19**. Professors in the Plasma Sources and Applications Centre/Space Propulsion Centre, NIE, Nanyang Technological University. 2019. “Mars Colonization: Beyond Getting There.” Global Challenges, vol. 3, no. 1.

Settlement of Mars—is it a dream or a necessity? From scientific publications to public forms, there is certainly little consensus on whether colonization of Mars is **necessary** or even **possible**, with a rich diversity of opinions that range from categorical It is a necessity!20 to equally categorical Should Humans Colonize Other Planets? No.21 A strong proponent of the idea, Orwig puts forward five reasons for Mars colonization, implicitly stating that establishing a permanent colony of humans on Mars is no longer an option but a real necessity.20 Specifically, these arguments are: **Survival of humans as a species**; Exploring the potential of life on Mars to sustain humans; Using space technology to positively contribute to our quality of life, from health to minimizing and reversing negative aspects of anthropogenic activity of humans on Earth; Developing as a species; Gaining political and economic leadership. The first argument captures the essence of what most space colonization proponents feel—our ever growing environmental footprint threatens the survival of human race on Earth. Indeed, a large body of evidence points to human activity as the main cause of extinction of many species, with shrinking biodiversity and depleting resources threatening the very survival of humans on this planet. Colonization of other planets could potentially increase the probability of our survival. While being at the core of such ambitious projects as Mars One, **a self-sustained colony of any size** on Mars **is hardly feasible in the foreseeable future**. Indeed, sustaining even a **small number** of colonists would require a **continuous supply of food, oxygen, water and basic materials**. At this stage, it is not clear whether it would be possible to establish a system that would generate these resources **locally**, or whether it would at least in part rely on the **delivery** of these resources (or **essential components** necessary for their local production) from **Earth**. Beyond the supply of these very basic resources, it would be quite challenging if not impossible for the colonists to independently produce **hi-tech but vitally important assets** such as medicines, electronics and robotics systems, or advanced materials that provide us with a decent **quality of life**. In this case, would their existence become little more than the **jogtrot of life**, as compared with the standards expected at the Earth?22

DL - Deep space travel scientifically impossible.

Einhorn '21 [Bruce; Reporter for Bloomberg; May 25; Bloomberg; "Elon Musk's Mars Ambition Could Be the Riskiest Human Quest Ever," https://www.bloomberg.com/news/articles/2021-05-25/elon-musk-s-mars-ambition-could-be-the-riskiest-human-quest-ever; DOA: 3-27-2025] tristan

The Apollo astronauts could fly to the moon in just a few days, but a trip to Mars would take anywhere between six to nine months. With the distance between Mars and Earth varying between 35 million miles and 249 million miles due to their elliptical orbits, there's only a small window available when the two are ideally aligned for space travel. That makes logistics much trickier.

With lunar exploration, "there's always the prospect of rescue or provisioning or supply from Earth or from a midway space station," said Alice Gorman, an associate professor at Flinders University in Adelaide and a member of the advisory council of the Space Industry Association of Australia. "That's not going to be the case for Mars." Solar Killers A long flight would expose humans to one of space travel's biggest terrors: solar flares. The most powerful type of explosion in the solar system, a flare is the equivalent of 100 million hydrogen bombs. The Earth's magnetic field can shield astronauts in orbit, but a deep-space traveler hit by such radiation would not be able to survive more than a few days.

"It's a very gruesome way to die," said Lewis Dartnell, a professor and specialist in astrobiology in the Department of Life Sciences at the University of Westminster in London. He does research linked to life on Mars.

The Apollo program didn't address this issue, choosing instead to take the chance that the few days of a lunar mission wouldn't coincide with a solar event. It would be a different story for multi-month trips to Mars.

Water tanks onboard the spacecraft could act as shields if positioned properly, said Dartnell, so in the event of a flare, travelers could retreat to the spacecraft's version of a panic room surrounded by water tanks. The problem is detecting activity on the Sun, especially on the side not facing the Earth. "How can we make our space weather prediction good enough that we can give the crew notice?" he said. "We don't have established capacity to observe the Sun from different angles for tracking solar storms."

Dust Storms

Radiation isn't just a problem en route. Mars has a much thinner atmosphere than Earth and doesn't have a global magnetic shield, so humans on the planet's surface would be at risk of exposure to solar and cosmic radiation. Moreover, the surface itself is largely dust, and massive storms can create dust clouds that block out the Sun, said Nilton Renno, a professor at the University of Michigan whose research interests include astrobiology.

3. Transitions
   They want to move to move to nuclear energy. Bc clean energy is too slow. Hhowver our evidence **Clean energy is rapidly advancing and solves energy needs by 2035. Beinhocker 25** they said their timeframe is 2027. And i dont think the us is ready to transition to many more nuclear in 2 yers . ity will decrease reguluation.
   its 2025 and 2035 seems pretty close to me. bUT THEY WANT TO MAKE IT EVEN FASTER WHICH IS BADLOOK TO OUR MELTDOWN contention. If we keep advancing too fast, **CURRENTLY, the NRC does just enough to maintain nuclear safety of the decreasing number of nuclear power plants in the US.**

Goldfin 23

We also dont know that the nuclear will actually work. Its a marketing tactic. First contention

Second. Cross apply our case if we win our renewables trade off we win the climate and peak oil scenario. Our second contentions

AND, transitioning to nuclear will kill tens of millions per year

Jacobson 24 [Mark Z. (Professor of Civil and Environmental Engineering & Director of the Atmosphere/Energy Program @ Stanford University), "7 reasons why nuclear energy is not the answer to solve climate change," OneEarth, Oct. 10, 2024, https://www.oneearth.org/the-7-reasons-why-nuclear-energy-is-not-the-answer-to-solve-climate-change/)]DOA 03-17-2025//abhi☺ ***Ellipsis in OG***

There is a small group of scientists that have proposed replacing 100% of the world's fossil fuel power plants with nuclear reactors as a way to solve climate change. Many others propose nuclear grow to satisfy up to 20 percent of all our energy (not just electricity) needs. They advocate that nuclear is a "clean" carbon-free source of power, but they don't look at the human impacts of these scenarios. Let's do the math... One nuclear power plant takes on average about 14-1/2 years to build, from the planning phase all the way to operation. According to the World Health Organization, about 7.1 million people die from air pollution each year, with more than 90 percent of these deaths from energy-related combustion. So switching out our energy system to nuclear would result in about 93 million people dying**, as we wait** for all the new nuclear plants to be built in the all-nuclear scenario. Utility-scale wind and solar farms, on the other hand, take on average **only two** to five years, from the planning phase to operation. Rooftop solar PV projects are down to only a 6-month timeline. So transitioning to 100% renewables as soon as possible would result in tens of millions fewer deaths. This illustrates a major problem with nuclear power and why renewable energy -- in particular Wind, Water, and Solar (WWS) -- avoids this problem. Nuclear, though, doesn't just have one problem. It has seven. Here are the seven major problems with nuclear energy: 1. Long Time Lag Between Planning and Operation The time lag between planning and operation of a nuclear reactor includes the times to identify a site, obtain a site permit, purchase or lease the land, obtain a construction permit, obtain financing and insurance for construction, install transmission, negotiate a power purchase agreement, obtain permits, build the plant, connect it to transmission, and obtain a final operating license. The planning-to-operation (PTO) times of all nuclear plants ever built have been 10-**19 years or more**. For example, the Olkiluoto 3 reactor in Finland was proposed to the Finnish cabinet in December 2000 to be added to an existing nuclear power plant. Its latest estimated completion date is 2020, giving it a PTO time of 20 years. The Hinkley Point nuclear plant was planned to start in 2008. It has an estimated the completion year of 2025 to 2027, giving it a PTO time of 17 to 19 years. The Vogtle 3 and 4 reactors in Georgia were first proposed in August 2006 to be added to an existing site. The anticipated completion dates are November 2021 and November 2022, respectively, given them PTO times of 15 and 16 years, respectively. The Haiyang 1 and 2 reactors in China were planned to start in 2005. Haiyang 1 began commercial operation on October 22, 2018. Haiyang 2 began operation on January 9, 2019, giving them PTO times of 13 and 14 years, respectively. The Taishan 1 and 2 reactors in China were bid in 2006. Taishan 1 began commercial operation on December 13, 2018. Taishan 2 is not expected to be connected until 2019, giving them PTO times of 12 and 13 years, respectively. Planning and procurement for four reactors in Ringhals, Sweden started in 1965. One took 10 years, the second took 11 years, the third took 16 years, and the fourth took 18 years to complete. Many claim that France's 1974 Messmer plan resulted in the building of its 58 reactors in 15 years. This is not true. The planning for several of these nuclear reactors began long before. For example, the Fessenheim reactor obtained its construction permit in 1967 and was planned starting years before. In addition, 10 of the reactors were completed between 1991-2000. As such, the whole planning-to-operation time for these reactors was at least 32 years, not 15. That of any individual reactor was 10 to 19 years. 2. Cost The levelized cost of energy (LCOE) for a new nuclear plant in 2018, based on Lazard, is $151 (112 to 189)/MWh. This compares with $43 (29 to 56)/MWh for onshore wind and $41 (36 to 46)/MWh for utility-scale solar PV from the same source. This nuclear LCOE is an underestimate for several reasons. First, Lazard assumes a construction time for nuclear of 5.75 years. However, the Vogtle 3 and 4 reactors, though will take at least 8.5 to 9 years to finish construction. This additional delay alone results in an estimated LCOE for nuclear of about $172 (128 to 215)/MWh, or a cost 2.3 to 7.4 times that of an onshore wind farm (or utility PV farm). Next, the LCOE does not include the cost of the major nuclear meltdowns in history. For example, the estimated cost to clean up the damage from three Fukushima Dai-ichi nuclear reactor core meltdowns was $460 to $640 billion. This is $1.2 billion, or 10 to 18.5 percent of the capital cost, of every nuclear reactor worldwide. In addition, the LCOE does not include the cost of storing nuclear waste for hundreds of thousands of years. In the U.S. alone, about $500 million is spent yearly to safeguard nuclear waste from about 100 civilian nuclear energy plants. This amount will only increase as waste continues to accumulate. After the plants retire, the spending must continue for hundreds of thousands of years with no revenue stream from electricity sales to pay for the storage. 3. Weapons Proliferation Risk The growth of nuclear energy has historically increased the ability of nations to obtain or harvest plutonium or enrich uranium to manufacture nuclear weapons. The Intergovernmental Panel on Climate Change (IPCC) recognizes this fact. They concluded in the Executive Summary of their 2014 report on energy, with "robust evidence and high agreement" that nuclear weapons proliferation concern is a barrier and risk to the increasing development of nuclear energy: Barriers to and risks associated with an increasing use of nuclear energy include operational risks and the associated safety concerns, uranium mining risks, financial and regulatory risks, unresolved waste management issues, nuclear weapons proliferation concerns, and adverse public opinion. The building of a nuclear reactor for energy in a country that does not currently have a reactor allows the country to import uranium for use in the nuclear energy facility. If the country so chooses, it can secretly enrich the uranium to create weapons-grade uranium and harvest plutonium from uranium fuel rods for use in nuclear weapons. This does not mean any or every country will do this, but historically some have and the risk is high, as noted by IPCC. The building and spreading of Small Modular Reactors (SMRs) may increase this risk further. 4. Meltdown Risk To date, 1.5 percent of all nuclear power plants ever built have melted down to some degree. Meltdowns have been either catastrophic (Chernobyl, Ukraine in 1986; three reactors at Fukushima Dai-ichi, Japan in 2011) or damaging (Three-Mile Island in 1979; Saint-Laurent France in 1980). The nuclear industry has proposed new reactor designs that they suggest are safer. However, these designs **are** generally **untested**, and there is no guarantee that the reactors will be designed, built, and operated correctly or that a natural disaster or act of terrorism, such as an airplane flown into a reactor, will not cause the **reactor** to **fail**, resulting in a major **disaster**. 5. Mining Lung Cancer Risk Uranium mining causes lung cancer in large numbers of miners because uranium mines contain natural radon gas, some of whose **decay products** are **carcinogenic**. A study of 4,000 uranium miners between 1950 and 2000 found that 405 (10 percent) died of lung cancer, a rate six times that expected based on smoking rates alone. 61 others died of mining-related lung diseases. Clean, renewable energy does not have this risk because (a) it does not require the continuous mining of any material, only one-time mining to produce the energy generators; and (b) the mining does not carry the same lung cancer risk that uranium mining does. 6. Carbon-Equivalent Emissions and Air Pollution There is no such thing as a zero- or close-to-zero emission nuclear power plant. Even existing plants emit due to the **continuous mining** and **refining** of **uranium** needed for the plant. **Emissions** from new nuclear are 78 to 178 g-CO2/kWh, not close to 0. Of this, 64 to 102 g-CO2/kWh over 100 years are emissions from the background grid while consumers wait 10 to 19 years for nuclear to come online or be refurbished, relative to 2 to 5 years for wind or solar. In addition, all nuclear plants emit 4.4 g-CO2e/kWh from the water vapor and heat they release. This contrasts with solar panels and wind turbines, which reduce heat or water vapor fluxes to the air by about 2.2 g-CO2e/kWh for a net difference from this factor alone of 6.6 g-CO2e/kWh. In fact, China's investment in nuclear plants that take so long between planning and operation instead of wind or solar resulted in China's **CO2 emissions increasing** 1.3 percent from 2016 to 2017 **rather than declining** by an estimated average of 3 percent. The resulting **difference in air pollution** emissions may have caused **69,000 additional air pollution deaths** in China in **2016 alone**, with additional deaths in years prior and since. 7. Waste Risk Last but not least, consumed fuel rods from nuclear plants are radioactive waste. Most fuel rods are stored at the same site as the reactor that consumed them. This has given rise to hundreds of radioactive waste sites in many countries that must be maintained and funded for at least 200,000 years, far beyond the lifetimes of any nuclear power plant. The more nuclear waste that accumulates, the greater the risk of **radioactive leaks**, which can **damage water** supply, **crops, animals**, and **humans**.

Climate change is existential

Sears 21 [Nathan; April 2021; Ph.D. Candidate in Political Science at the University of Toronto, former Professor of International Relations at the Universidad de Las Americas, Trudeau Fellow in Peace, Conflict, and Justice at the Munk School of Global Affairs; Conference Paper for the International Studies Association, "Great Powers, Polarity, and Existential Threats to Humanity: An Analysis of the Distribution of the Forces of Total Destruction in International Security," p. 1-38]

Climate Change Humanity faces **existential** risks from the **large-scale destruction** of Earth's natural environment making the planet less hospitable for humankind (Wallace-Wells 2019). The decline of some of Earth's natural systems may already exceed the "planetary boundaries" that represent a "safe operating space for humanity" (Rockstrom et al. 2009). Humanity has become one of the driving forces behind Earth's climate system (Crutzen 2002). The major anthropogenic drivers of climate change are the burning of fossil fuels (e.g., coal, oil, and gas), combined with the degradation of Earth's natural systems for absorbing carbon dioxide, such as deforestation for agriculture (e.g., livestock and monocultures) and resource extraction (e.g., mining and oil), and the warming of the oceans (Kump et al. 2003). While humanity has influenced Earth's climate since at least the Industrial Revolution, the dramatic increase in greenhouse gas emissions since the mid-twentieth century—the "Great Acceleration" (Steffen et al. 2007; 2015; McNeill & Engelke 2016)— is responsible for contemporary climate change, which has reached approximately 1°C above preindustrial levels (IPCC 2018). Climate change could become an existential **threat** to humanity if the planet's climate reaches a "**Hothouse Earth**" state (Ripple et al. 2020). What are the dangers? There are two mechanisms of climate change that threaten humankind. The direct threat is extreme heat. While human societies possesses **some** capacity for **adaptation** and resilience to climate change, the physiological response of humans to heat stress imposes **physical limits**—with a hard limit at roughly 35°C wet-bulb temperature (Sherwood et al. 2010). A rise in global average temperatures by 3–4°C would increase the risk of heat stress, while 7°C could render some regions uninhabitable, and 11–**12**°C would leave much of the planet **too hot** for human **habitation** (Sherwood et al. 2010). The **indirect** effects of climate change could include, inter alia, rising **sea levels** affecting coastal regions (e.g., Miami and Shanghai), or even swallowing entire countries (e.g., Bangladesh and the Maldives); extreme and unpredictable **weather** and **natural disasters** (e.g., hurricanes and forest fires); environmental pressures on **water** and **food scarcity** (e.g., droughts from less-dispersed rainfall, and lower wheat-yields at higher temperatures); the possible inception of new bacteria and **viruses**; and, of course, large-scale **human migration** (World Bank 2012; Wallace-Well 2019; Richards, Lupton & Allywood 2001). While it is difficult to determine the existential implications of extreme environmental conditions, there are historic **precedents** for the **collapse of human societies** under environmental pressures (Diamond 2005). Earth's "big five" mass extinction events have been **linked to** dramatic shifts in Earth's **climate** (Ward 2008; Payne & Clapham 2012; Kolbert 2014; Brannen 2017), and a Hothouse Earth climate would represent terra incognita for humanity. Thus, the assumption here is that a Hothouse Earth climate could pose an existential threat to the habitability of the planet for humanity (Steffen et al. 2018., 5). At what point could climate change cross the threshold of an existential threat to humankind? The complexity of Earth's natural systems makes it extremely difficult to give a precise figure (Rockstrom et al. 2009;). However, much of the concern about climate change is over the danger of crossing "**tipping points**," whereby **positive feedback loops** in Earth's climate system could lead to potentially **irreversible** and **self-reinforcing** "**runaway**" climate change. For example, the melting of Arctic "permafrost" could produce additional warming, as glacial retreat reduces the refractory effect of the ice and releases huge quantities of methane currently trapped beneath it. A recent study suggests that a "planetary **threshold**" could exist at global average temperature of **2°**C above preindustrial levels (Steffen et al. 2018; also IPCC 2018). Therefore, the analysis here takes the 2°C rise in global average temperatures as representing the lower-boundary of an existential threat to humanity, with higher temperatures increasing the risk of runaway climate change leading to a Hothouse Earth. The Paris Agreement on Climate Change set the goal of limiting the increase in global average temperatures to "well below" 2°C and to pursue efforts to limit the increase to 1.5°C. If the Paris Agreement goals are **met**, then nations would likely keep climate change **below the threshold** of an **existential** threat to humanity. According to Climate Action Tracker (2020), however, current policies of states are expected to produce global average temperatures of 2.9°C above preindustrial levels by 2100 (range between +2.1 and +3.9°C), while if states succeed in meeting their pledges and targets, global average temperatures are still projected to increase by 2.6°C (range between +2.1 and +3.3°C). Thus, while the Paris Agreements sets a goal that would reduce the existential risk of climate change, the actual policies of states could easily cross the threshold that would constitute an existential threat to humanity (CAT 2020).