### Framework

#### While I agree we must value justice, I disagree with my opponents criterion:

#### Therefore, the criterion to evaluate today's debate should be the veil of ignorance

#### Veil of ignorance dictates that you must achieve justice in this debate by voting on the greatest benefit to the least advantaged members of society

Birnbaum 10 (Simon Birnbaum, 12-1-2010, "Radical Liberalism: Rawls and the Welfare State Justifying the Politics of Basic Income," https://www.researchgate.net/publication/232833396\_Radical\_Liberalism\_Rawls\_and\_the\_Welfare\_State\_Justifying\_the\_Politics\_of\_Basic\_Income)//kh

The contractual device of the ‘original position’ is employed to bring out the meaning and implications of an impartial and equal concern for the interests of all, regardless of their circumstances or conceptions of the good life. Given the high stakes involved in this very special choice and given the assumption that the decision is final (we must be prepared to live a full life under the chosen set of principles, whatever the outcome) Rawls famously argued that the most rational rule for decision-making behind the veil of ignorance is maximin, i.e. ‘to adopt the alternative the worst outcome of which is superior to the worst outcomes of the others’ (Rawls 1971, pp. 152–153). In other words: we should select the institutional arrangement that provides an outcome **that is as beneficial as possible for the least advantaged**. Rawls proposes the following two principles of justice: Each person has the same and indefeasible claim to a fully adequate scheme of equal basic rights and liberties, which scheme is compatible with the same scheme of liberties for all. Social and economic inequalities are to satisfy two conditions: (a) They are to be attached to positions and offices open to all under conditions of fair equality of opportunity; and (b), they are to be to the greatest benefit of the least advantaged members of society (Rawls 1996, pp. 5–6, 2001, pp. 42–43).2

#### Space exploration is just if the negative can prove that other factors are responsible for inequitable profit distribution

Morgan 1 *(Professor, New York Law School; B.A., Yale College, 1986* (Denise C. Morgan, Fall 2001, Northwestern University Law Review)

Under a distributive theory of justice, then, equal citizens must receive equal distributions, but any deviation from equality can be justified by the greater or lesser merit of the recipient. Merit can be measured by any fixed criteria that are "chosen in light of, and ... applied to promote, the purpose that a given distribution is intended to realize." n21 While distributive justice does not require the plaintiff to prove the defendant's wrongful conduct in order to receive a remedy, it does require the plaintiff to show that the existing distribution of resources does not reward members of the political community in proportion to the selected criteria of merit. The defendant can defend the existing distribution - and show the plaintiff's misfortune to be justified - by proving that factors other than the selected criteria of merit are responsible for the disproportionate distribution, or that the distribution is proportionally equal according to some criteria of merit that are important in light of their adverse impact on plaintiff. Accordingly, the central features of distributive justice are actionable misfortune, causation, and proportional distribution according to fixed and important criteria.

#### Consequential framework destroys intrinsic value to life- they reduce human life to a calculable object.

Grisez, professor of Christian ethics @ Mount Saint Mary’s College and Shaw, Director of public information at Knights of Columbus, 94 (Germain and Russell, Absolutism and its Consequentialist Critics, ed. Haber, p. 25-26)

If there are no ethical absolutes, human persons, rather than being¶ the norm and source from which other things receive their value,¶ become simply items or commodities with a relative value-- inviolable¶ only up to the point at which it is expedient to violate them in order to¶ achieve an objective. It would then make no sense at all to speak of¶ the immeasurable value of the human person from being. Far from being immeasurable—that is, ¶ beyond calculation—the value of a person would be quite specific and quantifiable, something to be weighed in the balance¶ against other values.

#### Consequentialism views humans as commodities with values that are precise calculable while disregarding the immeasurable value of the human life.

### Contention 1

Contention 1 is Asteroid Mining

#### Asteroid mining is starting now. New legal frameworks and massive investments bring it close – maintaining progress is key

Gilbert 21 Alex Gilbert, 4-26-2021, "Mining in Space Is Coming," Milken Institute Review, https://www.milkenreview.org/articles/mining-in-space-is-coming//SJJK

Space exploration is back. after decades of disappointment, a combination of better technology, falling costs and a rush of competitive energy from the private sector has put space travel front and center. indeed, many analysts (even some with their feet on the ground) believe that commercial developments in the space industry may be on the cusp of starting the largest resource rush in history: mining on the Moon, Mars and asteroids. While this may sound fantastical, some baby steps toward the goal have already been taken. Last year, NASA awarded contracts to four companies to extract small amounts of lunar regolith by 2024, effectively beginning the [era of commercial space mining](https://payneinstitute.mines.edu/wp-content/uploads/sites/149/2020/09/Payne-Institute-Commentary-The-Era-of-Commercial-Space-Mining-Begins.pdf). Whether this proves to be the dawn of a gigantic adjunct to mining on earth — and more immediately, a key to unlocking cost-effective space travel — will turn on the answers to a host of questions ranging from what resources can be efficiently. As every fan of science fiction knows, the resources of the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). Visionaries including Jeff Bezos [imagine heavy industry moving to space](https://www.fastcompany.com/90347364/jeff-bezos-wants-to-save-earth-by-moving-industry-to-space) and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and governance. Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models. That said, there’s no grass growing under potential pioneers’ feet. Potential economic, scientific and even security benefits underlie an emerging [geopolitical competition](https://nationalinterest.org/feature/geostrategic-importance-outer-space-resources-154746) to pursue space mining. The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. The United States has adopted the world’s first spaceresources law, recognizing the property rights of private companies and individuals to materials gathered in space. However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we’ll need [new agreements](https://issues.org/new-policies-needed-to-advance-space-mining/) to facilitate private investment and ensure international cooperation.

#### Prohibitions on appropriation prevent asteroid mining despite growing space industries

Myers 16 -- Ross Myers (J.D. candidate at the University of Oregon Law School.), The Doctrine of Appropriation and Asteroid Mining: Incentivizing the Private Exploration and Development of Outer Space, 2016, Oregon Review of International Law, https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/19850/Meyers.pdf?sequence=1 WJ

Despite a decrease in national space program funding, corporate space missions are on the rise. In 2010, President Obama proposed that NASA exit the business of flying astronauts from Earth to low Earth orbit and move it to private companies.52 Several companies have stepped up to bat, and corporate space programs now include space tourism, supply missions, and in one case a one-way colonization mission to Mars.53 Corporate interest in space tourism and development demonstrates a strong private commercial interest in space as an industry, which could serve to finance the exploration of space in a period where national governments do not have an active financial interest in space. However, under current international treaties, the ownership of asteroids is prohibited, preventing corporations willing to invest in asteroid mining from having a secure claim.

#### Asteroid mining is key to solving water crises on Earth

Tillman 19 (Nola Taylor Tillman is a Freelance Science Writer at Redd Infinity. Graduate of Agnes Scott College.), “Tons of Water in Asteroids Could Fuel Satellites, Space Exploration”, Space, 9-29-19, <https://www.space.com/water-rich-asteroids-space-exploration-fuel.html> NT

When it comes to mining space for water, the best target may not be the moon: Entrepreneurs' richest options are likely to be asteroids that are larger and closer to Earth. **A recent study suggested that roughly 1,000 water-rich, or hydrated, asteroids near our planet are easier to reach than the lunar surface is.** While most of these space rocks are only a few feet in size, more than 25 of them should be large enough to each provide significant water. Altogether, the water locked in these asteroids should be enough to fill somewhere around 320,000 Olympics-size swimming pools — significantly more than the amount of water locked up at the lunar poles, the new research suggested. **Because asteroids are small, they have less gravity than Earth or the moon do, which makes them easier destinations to land on and lift off from**. If engineers can figure out how to mine water from these space rocks, they could produce a source of ready fuel in space that would allow spacecraft designers to build refuelable models for the next generation of satellites. Asteroid mining could also fuel human exploration, saving the expense of launching fuel from Earth. In both cases, would-be space-rock miners will need to figure out how to free the water trapped in hydrated minerals on these asteroids. "Most of the hydrated material in the near-Earth population is contained in the largest few hydrated objects," Andrew Rivkin, an asteroid researcher at Johns Hopkins University Applied Physics Research Laboratory in Maryland, told Space.com. Rivkin is the lead author on the paper, which estimated that near Earth asteroids could contain more easily accessible water than the lunar poles. "A sure thing" According to the United Nations Office for Outer Space Affairs, more than 5,200 of the objects launched into space are still in orbit today. While some continue to function, the bulk of them buzz uselessly over our heads every day. They carry fuel on board, and when they run out, they are either lowered into destructive orbits or left to become space junk, useless debris with the potential to cause enormous problems for working satellites. Refueling satellites in space could change that model, replacing it with long-lived, productive orbiters. "It's easier to bring fuel from asteroids to geosynchronous orbit than from the surface of the Earth," Rivkin said. "If such a supply line could be established, it could make asteroid mining very profitable." Hunting for space water from the surface of the Earth is challenging because the planet's atmosphere blocks the wavelength of light where water can be observed. The asteroid warming as it draws closer to the sun can also complicate measurements. Instead, Rivkin and his colleagues turned to a class of space rocks called Ch asteroids. Although these asteroids don't directly exhibit a watery fingerprint, they carry the telltale signal of oxidized iron seen only on asteroids with signatures of water-rich minerals, which means the authors felt confident assuming that all Ch asteroids carry this rocky water. Based on meteorite falls, a previous study estimated that Ch asteroids could make up nearly 10% of the near-Earth objects (NEOs). With this information, the researchers determined that there are between 26 and 80 such objects that are hydrated and larger than 0.62 miles (1 km) across. Right now, only three NEOs have been classified as Ch asteroids, although others have been spotted in the asteroid belt. Most NEOs are discovered and observed at wavelengths too short to reveal the iron band that marks the class. Carbon-rich asteroids, which include Ch asteroids and other flavors, are also darker than the more common stony asteroids, making them more challenging to observe. Although **Ch asteroids definitely contain water-rich minerals**, that doesn’t necessarily mean that they will always be the best bet for space mining. It comes down to risk. Would an asteroid-mining company rather visit a smaller asteroid that definitely has a moderate amount of water, or a larger one that could yield a larger payday but could also come up dry? "Whether getting sure things with no false positives, like the Ch asteroids, is more important or if a greater range of possibilities is acceptable with the understanding that some asteroids will be duds is something the miners will have to decide," Rivkin said.

#### Water access disproportionatley harms minority communities – in line with the veil of ignorance

Thompson ’19, Katie Thompson, 6-12-2019, "Clean Water and the Environmental Justice Movement — Shared Justice," Shared Justice, https://www.sharedjustice.org/most-recent/2019/6/12/clean-water-and-the-environmental-justice-movement)//SRA

**Many consider it self-evident that everyone should have access to safe, clean drinking water**. In fact, the United Nations has even declared access to clean water a human right. “The human right to water is indispensable for leading a life of human dignity,” the UN Committee on Economic, Social and Cultural Rights [stated](https://www.refworld.org/docid/4538838d11.html) in 2003. **“It is a prerequisite for the realization of other human rights**.” Unfortunately, despite the overall wealth and prosperity of America, access to safe drinking water is not a guarantee.

USA Today [reported](https://www.usatoday.com/story/news/2017/08/14/63-million-americans-exposed-unsafe-drinking-water/564278001/) that as many as **63 million Americans were exposed to unsafe drinking water between 2007 and 2017**. Unclean water can cause serious and costly health issues, and studies have found that poor and minority communities across the U.S. are [disproportionately affected](https://www.washingtonpost.com/news/energy-environment/wp/2016/01/27/its-not-just-flint-poor-communities-across-the-country-live-with-extreme-polluters/?utm_term=.975f7b9b7447) by polluted waters. Advocates refer to the **imbalance of environmental risk and exposure to pollution by poor and minority** **communities as** [**environmental injustice**](http://nationalhumanitiescenter.org/tserve/nattrans/ntuseland/essays/envjust.htm). The National Humanities Center defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.”

The Environmental Protection Agency’s Safe Drinking Water Act was passed by Congress in 1974; its purpose was to protect groundwater and other drinking sources provided to the public. Since then the EPA has been in charge of monitoring all drinking water on a federal level, by setting the national standards, and examining the health risk level of contaminants found in public drinking water.

In recent years, the protection and provision of clean water for the public has become a focal point of public health. The consequences of neglecting this responsibility have also become quite evident. Flint, Michigan is one of many examples of a poor community bearing the brunt of an environmental crisis, with 40 percent of Flint’s population living below the poverty line. In Flint, 12 people died of Legionnaires disease [linked to contaminated water](https://www.pbs.org/wgbh/frontline/article/flint-water-crisis-legionnaires-disease-deaths/) in 2014. An additional 6,000 to 12,000 children were exposed to lead in their water from old pipes, a hazard that  also [caused](https://grist.org/article/the-epa-failed-flint-now-we-know-exactly-how/) a 58 percent spike in fetal deaths.  Many consider **Flint’s crisis the result of environmental racism; the majority of its population (56%) is black, significant because its state is predominantly white**. The Michigan Civil Rights Commission’s report did indeed find that [racism played a role in Flint’s water crisis](https://www.mlive.com/news/flint/2017/02/racism_played_a_role_in_flint.html).

### Contention 2

Contention 2 is innovation

#### Ceasing commercial space decks innovation and industry growth

Lamine et al 21 (Wadid Lamine1 Alistair Anderson2 Sarah Jack3 Alain Fayolle4 1 Telfer School of Management, University of Ottawa 2 Lancaster University Management School, Lancaster University 3 House of Innovation, Stockholm School of Economics 4 Center for Innovation and Entrepreneurship Activities, University of Cagliari ), “New article examines entrepreneurship in the space industry”, Stockholm School of Economics, 2-24-21, <https://www.hhs.se/en/about-us/news/hoi-news/2021/new-article-examines-entrepreneurship-in-the-space-industry/> NT

The space industry is generally perceived as very innovative. Normally, one might expect innovative environments to be conducive to entrepreneurship. **However, the space industry seems to be an exception owing to the highly regulative impact of institutions operating within it.** Generally, institutions influence entrepreneurship and set out the “rules of the game” that shape enterprise or even prevent it. Currently, within academia, there is little research examining how institutions impact on entrepreneurship at an industry level. Studying entrepreneurship in the context of the space industry offers the opportunity to deepen academia’s understanding of industry-specific conditions that form the rules of the game for innovation. New research, conducted in part at the House of Innovation, seeks to understand how **entrepreneurship in the space industry is enabled and constrained by institutions**, and what this implies for the freedom to be entrepreneurial. The research findings suggest that the institutional framework has a profoundly negative effect on start-ups and growth. **Formal institutional factors in the space industry discourage entrepreneurial initiatives and stymie the growth of small firms.** This institutional context favors the established firms that dominate the sector, challenging entrepreneurship. To counteract this negative environment, the researchers recommend that policymakers: (1) strengthen private-public-partnership arrangements; (2) implement policies to attract venture capitalists to transform and reinvigorate the upstream segment; and (3) design specific incubation mechanisms for space start-ups. With these changes in place, the researchers remain confident that the space context could evolve into a wonderful launchpad from which entrepreneurship can take off. **These findings are based on a ten-year study** originating in an extended case study of a smaller entrepreneurial space industry firm. The case study was eventually extended to include other start-up founders and CEOs of existing businesses. Researchers then tapped into the perceptions of business angels and incubator managers and interviewed key influencers in large space companies and space agencies. These case studies and interviews combined yielded an appreciation of how different space industry stakeholders make sense of and inform their organizations’ entrepreneurial role and practices.

#### Privatization delivers on SBSPs now – that’s key to transition towards renewables and solve warming

Hughes and Soldini 20 (Amanda Jane Hughes is an engineer, qualified teacher and passionate science communicator. She have a BSc in Astrophysics and PhD in Solar Energy Engineering, and currently is a lecturer at the University of Liverpool. Dr. Stefania Soldini, Lecturer in Aerospace Engineering, in the Department of Mechanical, Materials and Aerospace Engineering, University of Liverpool, UK since 2019. ), “Solar power stations in space could be the answer to our energy needs”, The Conversation, 11-19-20, <https://theconversation.com/solar-power-stations-in-space-could-be-the-answer-to-our-energy-needs-150007> NT

It sounds like science fiction: **giant solar power stations floating in space that beam down enormous amounts of energy to Earth.** And for a long time, the concept – first developed by the Russian scientist, Konstantin Tsiolkovsky, in the 1920s – was mainly an inspiration for writers. A century later, however, scientists are making huge strides in turning the concept into reality. The European Space Agency has realised the potential of these efforts and is now looking to fund such projects, predicting that **the first industrial resource we will get from space is “beamed power”.** **Climate change is the greatest challenge of our time**, so there’s a lot at stake. From rising global temperatures to shifting weather patterns, the impacts of climate change are already being felt around the globe. Overcoming this challenge will require radical changes to how we generate and consume energy. Renewable energy technologies have developed drastically in recent years, with improved efficiency and lower cost. But one major barrier to their uptake is the fact that they don’t provide a constant supply of energy. Wind and solar farms only produce energy when the wind is blowing or the sun is shining – but we need electricity around the clock, every day. Ultimately, we need a way to store energy on a large scale before we can make the switch to renewable sources. Benefits of space **A possible way around this would be to generate solar energy in space.** There are many advantages to this. **A space-based solar power station could orbit to face the Sun 24 hours a day. The Earth’s atmosphere also absorbs and reflects some of the Sun’s light, so solar cells above the atmosphere will receive more sunlight and produce more energy.** But one of the key challenges to overcome is how to assemble, launch and deploy such large structures. A single solar power station may have to be as much as 10 kilometres squared in area – equivalent to 1,400 football pitches. Using lightweight materials will also be critical, as the biggest expense will be the cost of launching the station into space on a rocket. One proposed solution is to develop a swarm of thousands of smaller satellites that will come together and configure to form a single, large solar generator. In 2017, researchers at the California Institute of Technology outlined designs for a modular power station, consisting of thousands of ultralight solar cell tiles. They also demonstrated a prototype tile weighing just 280 grams per square metre, similar to the weight of card. Recently, developments in manufacturing, such as 3D printing, are also being looked at for this application. At the University of Liverpool, we are exploring new manufacturing techniques for printing ultralight solar cells on to solar sails. **A solar sail is a foldable, lightweight and highly reflective membrane capable of harnessing the effect of the Sun’s radiation pressure to propel a spacecraft forward without fuel.** We are exploring how to embed solar cells on solar sail structures to create large, fuel-free solar power stations. These methods would enable us to construct the power stations in space. Indeed, it could one day be possible to manufacture and deploy units in space from the International Space Station or the future lunar gateway station that will orbit the Moon. Such devices could in fact help provide power on the Moon. The possibilities don’t end there. While we are currently reliant on materials from Earth to build power stations, scientists are also considering using resources from space for manufacturing, such as materials found on the Moon. Another major challenge will be getting the power transmitted back to Earth. The plan is to convert electricity from the solar cells into energy waves and use electromagnetic fields to transfer them down to an antenna on the Earth’s surface. The antenna would then convert the waves back into electricity. Researchers led by the Japan Aerospace Exploration Agency have already developed designs and demonstrated an orbiter system which should be able to do this. There is still a lot of work to be done in this field, but the aim is that solar power stations in space will become a reality in the coming decades. **Researchers in China have designed a system called Omega, which they aim to have operational by 2050. This system should be capable of supplying 2GW of power into Earth’s grid at peak performance, which is a huge amount.** To produce that much power with solar panels on Earth, you would need more than six million of them. Smaller solar power satellites, like those designed to power lunar rovers, could be operational even sooner. Across the globe, the scientific community is committing time and effort to the development of solar power stations in space. Our hope is that they could one day be a vital tool in our fight against climate change.

#### climate change triggers sweeping death and population loss – disproportionatley impacts povertized regions

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

Today, about 30% of global population experiences deadly heat for over 20 days per year. By 2100, this will rise to 48% if GHG emissions are drastically reduced and 74% if they continue to grow (Mora et al., 2017).

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