#### Resolved: The appropriation of outer space by private entities is unjust.

### Util

#### 1---Util first

**Rakowski 93** Eric Rakowski [Taking and Saving Lives Author(s): Eric Rakowski Source: Columbia Law Review, Vol. 93, No. 5, (Jun., 1993), pp. 1063-1156 Published by: Columbia Law Review Association, Inc. Stable URL: <http://www.jstor.org/stable/1122960>]

On one side, it presses toward the consequentialist view that individuals' status as moral equals requires that the number of people kept alive be maximized. Only in this way, the thought runs, can we give due weight to the fundamental equality of persons; to allow more deaths when we can ensure fewer is to treat some people as less valuable than others. Further, killing some to save others**,** or letting some die for that purpose**,** does not entail that those who are killed or left to their fate are being used merely as means to the well-being of others, as would be true if they were slain or left to drown merely to please people who would live anyway**.** They do, of course, in some cases serve as means. But they do not act merely as means. Those who die are no less ends than those who live. It is because they are also no more ends than others whose lives are in the balance that an impartial decision-maker must choose to save the more numerous group, even if she must kill to do so.

#### 2---Reducing existential risks is the top priority in any coherent moral theory

Plummer 15 (Theron, Philosophy @St. Andrews http://blog.practicalethics.ox.ac.uk/2015/05/moral-agreement-on-saving-the-world/)

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

#### 3---Weigh magnitude times probability---“probability first” framing is rooted in psychological biases and leads to mass death

Clarke 08 [Lee, member of a National Academy of Science committee that considered decision-making models, Anschutz Distinguished Scholar at Princeton University, Fellow of AAAS, Professor Sociology (Rutgers), Ph.D. (SUNY), “Possibilistic Thinking: A New Conceptual Tool for Thinking about Extreme Events,” Fall, Social Research 75.3, JSTOR]

In scholarly work, the subfield of disasters is often seen as narrow. One reason for this is that a lot of scholarship on disasters is practically oriented, for obvious reasons, and the social sciences have a deep-seated suspicion of practical work. This is especially true in sociology. Tierney (2007b) has treated this topic at length, so there is no reason to repeat the point here. There is another, somewhat unappreciated reason that work on disaster is seen as narrow, a reason that holds some irony for the main thrust of my argument here: disasters are unusual and the social sciences are generally biased toward phenomena that are frequent. Methods textbooks caution against using case stud- ies as representative of anything, and articles in mainstreams journals that are not based on probability samples must issue similar obligatory caveats. The premise, itself narrow, is that the only way to be certain that we know something about the social world, and the only way to control for subjective influences in data acquisition, is to follow the tenets of probabilistic sampling. This view is a correlate of the central way of defining rational action and rational policy in academic work of all varieties and also in much practical work, which is to say in terms of probabilities. The irony is that probabilistic thinking has its own biases, which, if unacknowledged and uncorrected for, lead to a conceptual neglect of extreme events. This leaves us, as scholars, paying attention to disasters only when they happen and doing that makes the accumulation of good ideas about disaster vulnerable to issue-attention cycles (Birkland, 2007). These conceptual blinders lead to a neglect of disasters as "strategic research sites" (Merton, 1987), which results in learning less about disaster than we could and in missing opportunities to use disaster to learn about society (cf. Sorokin, 1942). We need new conceptual tools because of an upward trend in frequency and severity of disaster since 1970 (Perrow, 2007), and because of a growing intellectual attention to the idea of worst cases (Clarke, 2006b; Clarke, in press). For instance, the chief scientist in charge of studying earthquakes for the US Geological Service, Lucile Jones, has worked on the combination of events that could happen in California that would constitute a "give up scenario": a very long-shaking earthquake in southern California just when the Santa Anna winds are making everything dry and likely to burn. In such conditions, meaningful response to the fires would be impossible and recovery would take an extraordinarily long time. There are other similar pockets of scholarly interest in extreme events, some spurred by September 11 and many catalyzed by Katrina. The consequences of disasters are also becoming more severe, both in terms of lives lost and property damaged. People and their places are becoming more vulnerable. The most important reason that vulnerabilities are increasing is population concentration (Clarke, 2006b). This is a general phenomenon and includes, for example, flying in jumbo jets, working in tall buildings, and attending events in large capacity sports arenas. Considering disasters whose origin is a natural hazard, the specific cause of increased vulnerability is that people are moving to where hazards originate, and most especially to where the water is. In some places, this makes them vulnerable to hurricanes that can create devastating storm surges; in others it makes them vulnerable to earthquakes that can create tsunamis. In any case, the general problem is that people concentrate themselves in dangerous places, so when the hazard comes disasters are intensified. More than one-half of Florida's population lives within 20 miles of the sea. Additionally, Florida's population grows every year, along with increasing development along the coasts. The risk of exposure to a devastating hurricane is obviously high in Florida. No one should be surprised if during the next hurricane season Florida becomes the scene of great tragedy. The demographic pressures and attendant development are wide- spread. People are concentrating along the coasts of the United States, and, like Florida, this puts people at risk of water-related hazards. Or consider the Pacific Rim, the coastline down the west coasts of North and South America, south to Oceania, and then up the eastern coast- line of Asia. There the hazards are particularly threatening. Maps of population concentration around the Pacific Rim should be seen as target maps, because along those shorelines are some of the most active tectonic plates in the world. The 2004 Indonesian earthquake and tsunami, which killed at least 250,000 people, demonstrated the kind of damage that issues from the movement of tectonic plates. (Few in the United States recognize that there is a subduction zone just off the coast of Oregon and Washington that is quite similar to the one in Indonesia.) Additionally, volcanoes reside atop the meeting of tectonic plates; the typhoons that originate in the Pacific Ocean generate furiously fatal winds. Perrow (2007) has generalized the point about concentration, arguing not only that we increase vulnerabilities by increasing the breadth and depth of exposure to hazards but also by concentrating industrial facilities with catastrophic potential. Some of Perrow's most important examples concern chemical production facilities. These are facilities that bring together in a single place multiple stages of production used in the production of toxic substances. Key to Perrow's argument is that there is no technically necessary reason for such concentration, although there may be good economic reasons for it. The general point is that we can expect more disasters, whether their origins are "natural" or "technological." We can also expect more death and destruction from them. I predict we will continue to be poorly prepared to deal with disaster. People around the world were appalled with the incompetence of America's leaders and orga- nizations in the wake of Hurricanes Katrina and Rita. Day after day we watched people suffering unnecessarily. Leaders were slow to grasp the importance of the event. With a few notable exceptions, organi- zations lumbered to a late rescue. Setting aside our moral reaction to the official neglect, perhaps we ought to ask why we should have expected a competent response at all? Are US leaders and organiza- tions particularly attuned to the suffering of people in disasters? Is the political economy of the United States organized so that people, espe- cially poor people, are attended to quickly and effectively in noncri- sis situations? The answers to these questions are obvious. If social systems are not arranged to ensure people's well-being in normal times, there is no good reason to expect them to be so inclined in disastrous times. Still, if we are ever going to be reasonably well prepared to avoid or respond to the next Katrina-like event, we need to identify the barriers to effective thinking about, and effective response to, disas- ters. One of those barriers is that we do not have a set of concepts that would help us think rigorously about out-sized events. The chief toolkit of concepts that we have for thinking about important social events comes from probability theory. There are good reasons for this, as probability theory has obviously served social research well. Still, the toolkit is incomplete when it comes to extreme events, especially when it is used as a base whence to make normative judgments about what people, organizations, and governments should and should not do. As a complement to probabilistic thinking I propose that we need possibilistic thinking. In this paper I explicate the notion of possibilistic thinking. I first discuss the equation of probabilism with rationality in scholarly thought, followed by a section that shows the ubiquity of possibilis- tic thinking in everyday life. Demonstrating the latter will provide an opportunity to explore the limits of the probabilistic approach: that possibilistic thinking is widespread suggests it could be used more rigorously in social research. I will then address the most vexing prob- lem with advancing and employing possibilistic thinking: the prob- lem of infinite imagination. I argue that possibilism can be used with discipline, and that we can be smarter about responding to disasters by doing so.

### 1AC- Capitalism

#### A public/private collaboration is already happening and necessary to have any possibility of reaching Mars.

Masunaga and Puzzanghera 16 (“Getting humans to Mars will require NASA and private companies to team up, Obama says,” BY SAMANTHA MASUNAGA, Samantha Masunaga is a business reporter for the Los Angeles Times. She’s worked at the paper since 2014. AND JIM PUZZANGHERA, Jim Puzzanghera covered business and economic issues from the Los Angeles Times’ Washington, D.C., bureau. He joined The Times in 2006 and won the paper’s Editor’s Award in 2009 for coverage of the financial crisis. He has worked in the nation’s capital since 1998 and is a two-time National Press Club award winner for Washington coverage. A Northwestern University graduate, he previously worked for the San Jose Mercury News, Newsday and the St. Petersburg Times., OCT. 11, 2016, Los Angeles Times, https://www.latimes.com/business/la-fi-obama-mars-20161011-snap-story.html)

Reporting from Washington — President Obama hammered home his goal to send humans to Mars by the 2030s, while acknowledging that accomplishing it would require public and private collaboration. Obama first said in 2010 he wanted to send astronauts “to orbit Mars and return them safely to Earth” by the mid-2030s with “a landing on Mars” to follow. In an [opinion article](https://www.cnn.com/2016/10/11/opinions/america-will-take-giant-leap-to-mars-barack-obama/index.html?sr=twCNN101116america-will-take-giant-leap-to-mars-barack-obama0105PMStoryLink&linkId=29798674) Tuesday on CNN.com, Obama said the ultimate ambition was not only to send humans to Mars and bring them back, but to “remain there for an extended time.” “Getting to Mars will require continued cooperation between government and private innovators, and we’re already well on our way,” he said. Obama’s article comes two weeks after SpaceX Chief Executive Elon Musk laid out an ambitious plan to eventually send 1 million people to colonize the red planet and turn humans into a multiplanetary species within 40 to 100 years. In a speech at the International Astronautical Congress in Mexico, Musk similarly called for a public/private partnership. NASA is working with Hawthorne-based SpaceX and aerospace giant Boeing Co. to develop crew capsules to take astronauts to the International Space Station. NASA relies on SpaceX and aerospace firm Orbital ATK to deliver supplies and cargo to the space station. This week, Obama will speak at the White House Frontiers conference in Pittsburgh, an event that will focus on innovations in science and technology, including a future Mars mission. Executives from companies such as SpaceX, Virgin Galactic and moon mining firm Moon Express are also set to speak at the conference. “It just underlines the theme that’s run through the Obama administration, which is encouraging partnerships with the private sector, providing additional opportunities for work and, when appropriate, doing business in a slightly different way,” said John Logsdon, professor emeritus of the Space Policy Institute at George Washington University. “It’s mainly about leaving a legacy,” he said. Analysts said a public/private partnership recognizes the reality of the space business today, as well as financial limitations. “On the commercial side, there are a lot of innovative ideas,” said Bill Ostrove, aerospace and defense analyst at Forecast International. “But they need that backing from the government both in the know-how … (and) the government’s financial resources.” Smaller space start-ups that don’t usually work with the government could benefit most from Obama’s goal, said Eric Stallmer, president of the Commercial Spaceflight Federation trade group. “I think it gives a level of excitement to a variety of different players,” he said. “You don’t know who the next SpaceX could be, or the next Blue Origin,” referring to the space tourism company started by Amazon.com founder Jeff Bezos. SpaceX, whose full name is Space Exploration Technologies Corp., has said its first test flight of an interplanetary vehicle could come in four years. A crewed mission could launch in late 2024 and arrive on Mars in 2025. Developing the interplanetary transport system could cost SpaceX $10 billion. In an email, SpaceX spokesman Phil Larson said it was “exciting to see President Obama advocate for the next frontier in human space flight,” and that the company was looking forward to “participating in the journey.” The company’s plan to send an unmanned Dragon spacecraft to the red planet as early as 2018 will provide an early chance to demonstrate how private space companies and NASA can work together, said Charles Lurio, publisher of the Lurio Report newsletter on entrepreneurial spaceflight. SpaceX will use the flight to test landing capabilities, interplanetary navigation and other systems. NASA will provide some technical support for the mission because it is interested in the entry, descent and landing data. Marco Caceres, senior space analyst at the Teal Group, estimated that a mission to Mars done the “traditional way” by NASA could cost at least $1 trillion. Oftentimes, large space programs can get delayed if Congress does not grant the requested funding amount, or if there are technical problems along the way. A public/private partnership may speed up the timeline and could lower that cost below $1 trillion, Caceres said. But one of the biggest questions is whether such a program could get funding from Congress, said Ostrove of Forecast International. “There is some desire to do the actual exploration,” he said. “I think that there’s maybe not necessarily the political will to spend the money on these types of programs when there’s so many other things we’re facing now.” One question still to be answered is who will build the massive rockets needed to get to Mars. NASA plans to send its Space Launch System rocket to an asteroid in the mid-2020s and to Mars in the 2030s. [Boeing Chief Executive Dennis Muilenburg has said](https://www.bloomberg.com/news/articles/2016-10-04/boeing-ceo-vows-to-beat-musk-to-mars-as-new-space-race-beckons) he thinks the first person to land on Mars will “arrive there riding a Boeing rocket,” a reference to the company’s role on the SLS project. That is a challenge to Musk, who described a rocket booster measuring 39 feet in diameter. When stacked with the SpaceX Mars spaceship, the interplanetary transport system would be 400 feet tall. In a statement Tuesday, John Elbon, vice president and general manager of Boeing Space Exploration, said that sending humans to Mars is “an achievable and inspiration goal for this country.” “This isn’t science fiction,” he said. “We’re building real hardware right now and NASA has a solid plan to get there.” Meanwhile, new research pointed out the risks of any Mars flights. [Scientists studying the potential effects](https://www.latimes.com/science/sciencenow/la-sci-sn-space-brain-20161011-snap-story.html) of cosmic rays on astronauts’ brains during deep space missions to Mars or beyond found that rodents who were exposed to radiation still suffered from brain inflammation and neural damage six months later. Achieving Obama’s Mars ambition, of course, will be out of his hands. SpaceNews [reported](https://spacenews.com/clinton-supports-human-mars-exploration/) last month that Democratic presidential nominee Hillary Clinton said she supported plans to send humans to Mars in response to a questionnaire on science policy from ScienceDebate.org. Republican presidential nominee Donald Trump praised space exploration but did not say he supported a human Mars mission. “Hopefully it’s a challenge to the next administration,” said Stallmer of the Commercial Spaceflight Federation.

#### The system ensures perpetual commodification until absolute zero—this culminates in the extinction of humanity through environmental degradation.

**Foster & Magdoff 10** (John Bellamy and Fred, professor of sociology at the University of Oregon and professor emeritus at the University of Vermont, March, “What Every Environmentalist Needs to Know About Capitalism,” Monthly Review, <http://monthlyreview.org/2010/03/01/what-every-environmentalist-needs-to-know-about-capitalism/>)

**The** foregoing **analysis**, if correct, **points to the fact that the ecological crisis cannot be solved within the logic of the present system.** The various suggestions for doing so have no hope of success. **The system of world capitalism is clearly unsustainable in: (1) its quest for never ending accumulation of capital leading to production that must continually expand to provide profits; (2) its agriculture and food system that pollutes the environment and still does not allow universal access to a sufficient quantity and quality of food; (3) its rampant destruction of the environment; (4) its continually recreating and enhancing of the stratification of wealth within and between countries; and (5) its search for technological magic bullets as a way of avoiding the growing social and ecological problems arising from its own operations. The transition to a**n ecological—which we believe must also be a **socialist**—**economy will be a steep ascent and will not occur overnight.** This is not a question of “storming the Winter Palace.” Rather, **it is a dynamic, multifaceted struggle for a new cultural compact and a new productive system. The struggle is ultimately against the system of capital. It must begin, however, by opposing the logic of capital, endeavoring in the here and now to create in the interstices of the system a new social metabolism rooted in egalitarianism, community, and a sustainable relation to the earth.** The basis for the creation of sustainable human development must arise from within the system dominated by capital, without being part of it, just as the bourgeoisie itself arose in the “pores” of feudal society.54 Eventually, these initiatives can become powerful enough to constitute the basis of a revolutionary new movement and society.All over the world, such struggles in the interstices of capitalist society are now taking place, and are too numerous and too complex to be dealt with fully here. Indigenous peoples today, given a new basis as a result of the ongoing revolutionary struggle in Bolivia, are reinforcing a new ethic of responsibility to the earth. La Vía Campesina, a global peasant-farmer organization, is promoting new forms of ecological agriculture, as is Brazil’s MST (Movimento dos Trabalhadores Rurais Sem Terra), as are Cuba and Venezuela. Recently, Venezulean President Hugo Chávez stressed the social and environmental reasons to work to get rid of the oil-rentier model in Venezuela, a major oil exporter.55 **The climate justice movement is demanding egalitarian and anti-capitalist solutions to the climate crisis.** Everywhere radical, essentially anti-capitalist, strategies are emerging, based on other ethics and forms of organization, rather than the profit motive: ecovillages; the new urban environment promoted in Curitiba in Brazil and elsewhere; experiments in permaculture, and community-supported agriculture, farming and industrial cooperatives in Venezuela, etc. The World Social Forum has given voice to many of these aspirations. As leading U.S. environmentalist James Gustave Speth has stated: “The international social movement for change—which refers to itself as ‘the irresistible rise of global anti-capitalism’—is stronger than many may imagine and will grow stronger.”56 **The reason that the opposition to the logic of capitalism—ultimately seeking to displace the system altogether—will grow more imposing is that there is no alternative, if the earth as we know it, and humanity itself, are to survive.** Here, the aims of ecology and socialism will necessarily meet. It will become increasingly clear that the distribution of land as well as food, health care, housing, etc. should be based on fulfilling human needs and not market forces. This is, of course, easier said than done. But it means making economic decisions through democratic processes occurring at local, regional, and multiregional levels. We must face such issues as: (1) How can we supply everyone with basic human needs of food, water, shelter, clothing, health care, educational and cultural opportunities? (2) How much of the economic production should be consumed and how much invested? and (3) How should the investments be directed? In the process, people must find the best ways to carry on these activities with positive interactions with nature—to improve the ecosystem. New forms of democracy will be needed, with emphasis on our responsibilities to each other, to one’s own community as well as to communities around the world. Accomplishing this will, of course, require social planning at every level: local, regional, national, and international—which can only be successful to the extent that it is of and by, and not just ostensibly for, the people.57 **The very purpose of the new sustainable system**, which is the necessary outcome of these innumerable struggles (necessary in terms of survival and the fulfillment of human potential), **must be to satisfy the basic material and non-material needs of all the people, while protecting the global environment as well as local and regional ecosystems. The environment is not something “external” to the human economy, as our present ideology tells us; it constitutes the essential life support systems for all living creatures.** To heal the “metabolic rift” between the economy and the environment means new ways of living, manufacturing, growing food, transportation and so forth.[60](https://monthlyreview.org/2010/03/01/what-every-environmentalist-needs-to-know-about-capitalism/#en7) **Such a society must be sustainable; and sustainability requires substantive equality, rooted in an egalitarian mode of production and consumption.**

#### Space appropriation only furthers capitalism and leads to endless militarism.

Dudley-Flores 7, Chief Research Scientist @ OPS-Alaska, and Gangale, Exec Director @ OPS-Alaska, 7 (Marilyn, prof @ Sonoma State, and Thomas, Professional Member @ American Institute of Aeronautics and Astronautics, “The Globalization of Space – The Astrosociological Approach”, 2007, Accessed 6/32/16, AIAA SPACE 2007 Conference & Exposition, p. 2-3) srivats\_narayanan

When the primary author first presented the notion of a “globalization of space,” at a sociology conference, she bumped into the tussling that goes on over the term “globalization.” In many quarters, the term is perceived as a deliberate evil economic process, paraded as natural progress, on the part of connivers in the Western world to lower trade tariffs to zero (neoliberal manipulators) and to construct a U.S. foreign policy that is aggressive, even militaristic (neoconservative manipulators). When the term is not understood as that, then it is seen as an effort on the part of connivers to harness the natural social forces of globalization to make profits and dominate the world. We understand the term in this way: Globalization is the growing interconnectedness of all people and their societies on a worldwide scale. It is an emergent multidimensional phenomenon of which issues of economy are only a portion. Although the evolutionary track of globalization can be traced back many centuries, the awareness of the process is relatively recent, which may account for the quibbling over what it is. A kind of global consciousness has emerged as a function of rapid transportation from one continent to another and of information technology. In what has been characterized as the “fifth phase of globalization,” begun in the late sixties and which continues today, global consciousness has increased, aided by space exploration (Robertson 1992).1 The American space program has, for years, been keen to show consumers how it enhances their lives through such “spin-offs” as Velcro and Teflon. But, the truth of the matter is, engaging the space environment has done far more than giving us a few nifty materials. It has done nothing short of putting the “quantum leap” into the globalization process. B. Space and Globalization Space exploration cultivated the process of miniaturization of instrumentation. The early rockets could carry only a small payload. “Weight reduction was imperative, and the miniaturization of equipment of every kind, including computers, was one of the more obvious solutions (Nolan and Lenski 1999, p. 227).”2 Miniaturization made possible the cascade of advances in computer and satellite technology. It is a bit of an irony that the fifth, or current, phase of globalization has been called “The Uncertainty Phase”, for the satellite, landmark instrument of space exploration, allows humans to reflect upon their global image. And, not much is hidden from its detection. It extends the reach and awareness of humankind. Satellite imagery allows us to predict the weather on a global scale. Comsats give us the capacity for instantaneous and easy communication nearly anywhere in the world. A poignant example was the climber on Everest who phoned his wife back home as he lay dying. The satellite is a tool of the global economy. For instance, it tells us if Sri Lanka will have a good tea crop this year and will, therefore, be able to meet its foreign debts. It processes a host of financial transactions. As an instrument of the Cold War, the satellite aided the end of it by speeding up the process of globalization across several broad categories of interactive phenomena: information technology, ecological effects, social movements and organizations, concern for equal rights, global recognition, the quest for breakthrough ideas, and economic growth. These things have been identified as the key patterns of interaction driving the globalization process (Peterson, Wunder, and Mueller 1999, pp. 16-19).3 The computer has been heralded as the landmark invention of the advanced industrial way of life. But, it is the satellite and all that it could do in Earth orbit that provided much impetus behind computer technology. Computers were necessary to the guidance of the rockets that were the satellites’ delivery systems; they were needed to track the satellites; and they were needed to process the huge amount of data that came from them. The computer and the satellite are the heart and soul of information technology (IT). Information technology. This is the technology of communication and information. Of the categories of things that drive the globalization process, this one is the most seminal. For, it increases the frequency of human interactions at an exponential rate. The speed of social change is itself partly a function of the speed and ease of these interactions. Rapid exchange and processing of information contribute to the global erosion of hierarchical structures. Hierarchical structures are the hallmark of tribalism, nationalistic movements, entrenched governmental bureaucracies, and most corporations. This is not to say that the erosion of hierarchical structures will lead to chaos and disorder, as in the total destruction of law and order. What it will lead to is the kind of chaos that physicists and mathematicians speak of, the mathematical chaos that underpins a reordering of a system. The reason the process of globalization is said to be at an uncertain stage has to do with this. With the Cold War over, world societies are experiencing a renegotiation of global civil order. There lies the uncertainty. The Cold War was all about who would dominate the process of globalization. Fresh in the minds of all “cold warriors” was World War II. The familiar fear of a one-world order imposed by a leader like Hitler got carried over to the fear of global dictatorial hierarchy imposed by the West or the Eastern Bloc, the inheritors of the Heartland of the 1940s world. After the war, paranoia ran high on both sides, each thinking the other was gaining the upper hand, fueled by the megatonage each possessed in their nuclear arsenals. The fear of world domination was incompletely salved by the fear of Mutually Assured Destruction (MAD). And, what would deliver this Mutually Assured Destruction? None other than rockets on suborbital trajectories bound for targets like New York and Moscow, the dreaded Intercontinental Ballistic Missiles (ICBM), courtesy of space research and development. In the end, the process of globalization itself ended the Cold War. The only “winners” in that war were the societies that had a more open stance toward globalization. The old fear of Mutually Assured Destruction has given way to the uncertainty of the re-negotiation period. Non-state actors want in on the renegotiations. They are not a new historical phenomenon. Typically, their troublemaking for state actors had a limited geographic range. But, now they can hook up over the Internet, jet to face-to-face confabs, sneak money around electronically, videograph their bombings and beheadings and videostream them to a world audience, and franchise out with the rapidity of fingers on a keyboard. The Cold War is over – what now? What now, indeed. Information technology and all the other things that drive the globalization process are breeding the new social forms that will make up the re-negotiating global civil order. A world order that, in the decades and centuries to come, will find itself extending off the planet.

#### The exploration link—it spreads capitalism—

#### 1. Globalization—Dudley-Flores indicates that exploration has side effects where technological advances increase the productive capacity of capitalism and accelerate the system.

#### 2. Commodification—exploration leads to the harnessing of the resources in space for profit that only advances corporatism—the “next great frontier” really just means “the next source of profit” because of structural differences like the “inside” and “outside”.

#### 3. Discourse makes the earth disposable and guarantees extinction before solvency.

Tort 5 Julien Tort, UNESCO (Working paper for the Ethical Working Group on Astrobiology and Planetary Protection of ESA (EWG) July 28, 2005“Exploration and Exploitation: Lessons Learnt from the Renaissance for Space Conquest” http://portal.unesco.org/shs/en/ev.php-URL\_ID=6195&URL\_DO=DO\_TOPIC&URL\_SECTION=-465.html  
The scenario in which extraterrestrial room is used as a response to the degradation of the terrestrial environment also leads us to the second question that may be asked when considering the parallel between the conquest of the West and the exploration of space. While the possibility of colonizing celestial bodies may seem distant, it diverts attention from terrestrial issues in a very real way. The paradigm of the accumulation of Capital is profoundly bound to the pollution and the overexploitation of natural resources. Likening space exploration to the discovery of America may then be misleading and dangerous. There is –most probably— no new earth to be discovered through space conquest and it is, so far, unlikely that any relief can come from outer space for environmental pain. Furthermore, even if the possibility of human settlements on other celestial bodies was likely, would it still be right to neglect the terrestrial environment, with the idea that we can go and live elsewhere when we are done with this specific planet (again a scenario that science fiction likes: see for example the end of Isaac Asimov’s Foundation)? In a way, the presentation of space as a new area for conquest and expansion tends to deny that the model of the limitless exploitation of natural resources is facing a crisis.

### 1AC- Exploration Fails

#### Exploration of outer space always fails – capitalists are too caught up in profit and never look to long term success

Dickens 10[Peter, Professor of Sociology at Cambridge University “The Humanization of the Cosmos—To What End?”, The Monthly Review, <http://monthlyreview.org/2010/11/01/the-humanization-of-the-cosmos-to-what-end/>] KLu

In the early twentieth century, Rosa Luxemburg argued that an “outside” to capitalism is important for two main reasons. First, it is needed as a means of creating massive numbers of new customers who would buy the goods made in the capitalist countries.7 As outlined earlier, space technology has extended and deepened this process, allowing an increasing number of people to become integral to the further expansion of global capitalism. Luxemburg’s second reason for imperial expansion is the search for cheap supplies of labor and raw materials. Clearly, space fiction fantasies about aliens aside, expansion into the cosmos offers no benefits to capital in the form of fresh sources of labor power.8 But expansion into the cosmos does offer prospects for exploiting new materials such as those in asteroids, the moon, and perhaps other cosmic entities such as Mars. Neil Smith’s characterization of capital’s relations to nature is useful at this point. The reproduction of material life is wholly dependent on the production and reproduction of surplus value. To this end, capital stalks the Earth in search of material resources; nature becomes a universal means of production in the sense that it not only provides the subjects, objects and instruments of production, but is also in its totality an appendage to the production process…no part of the Earth’s surface, the atmosphere, the oceans, the geological substratum or the biological superstratum are immune from transformation by capital.9 Capital is now also “stalking” outer space in the search for new resources and raw materials. Nature on a cosmic scale now seems likely to be incorporated into production processes, these being located mainly on earth. Since Luxemburg wrote, an increasing number of political economists have argued that the importance of a capitalist “outside” is not so much that of creating a new pool of customers or of finding new resources.10 Rather, an outside is needed as a zone into which surplus capital can be invested. Economic and social crisis stems less from the problem of finding new consumers, and more from that of finding, making, and exploiting zones of profitability for surplus capital. Developing “outsides” in this way is also a product of recurring crises, particularly those of declining economic profitability. These crises are followed by attempted “fixes” in distinct geographic regions. The word “fix” is used here both literally and figuratively. On the one hand, capital is being physically invested in new regions. On the other hand, the attempt is to fix capitalism’s crises. Regarding the latter, however, there are, of course, no absolute guarantees that such fixes will really correct an essentially unstable social and economic system. At best, they are short-term solutions.

#### 1. Space exploration under capitalism just creates disposability of earth rhetoric that means that we exploit the Earth even more and deplete its resources before we can escape.

#### 2. Class differences mean that only the richest would be able to afford a ticket on the spaceships so poor and non-Western populations will be left on the earth to die.

Bachman 17 (“You Only Have to Be Rich, Not Healthy, to Fly in Space,” By [Justin Bachman](https://www.bloomberg.com/authors/APy9HDRlaF8/justin-bachman), December 6, 2017, Bloomberg, https://www.bloomberg.com/news/features/2017-12-06/how-to-survive-your-virgin-galactic-blue-origin-spacex-flight)

The so-called “space billionaires”—Jeff Bezos, Richard Branson and Elon Musk—imagine a day when people will live and work in space, gradually transforming humanity into a multi-planet species. The next step in that direction is the development of a space tourism industry, and that’s about to become a reality. The rich will go first, of course, paying hundreds of thousands of dollars to be astronauts—if only for a few minutes. These extreme-tourism-style flights by Blue Origin, Virgin Galactic and SpaceX are seen as a precursor to an era when blasting to and from space will be considered as routine as flying from New York to Chicago. The preparation needed to make these civilian rides work is also crucial for the kind of point-to-point [hypersonic flights](https://www.bloomberg.com/news/articles/2017-09-29/how-crazy-is-elon-musk-s-hypersonic-space-rocket-airline) that Musk and others have envisioned as a way to shrink travel times across the Earth. Yet, when it comes to actual commercial spaceflight, these space trips will present a demanding environment for anyone who isn’t a fighter pilot or a real astronaut. Fleeing and re-entering the atmosphere is a dynamic, stressful experience, thanks to the forces of gravity and millions of pounds of thrust powering an ascent that reaches thousands of miles per hour. “It’s not like just walking on an airplane and putting on your lap belt and reading a book or falling asleep,” said Dr. James Vanderploeg, chief medical officer for Virgin Galactic, which could begin launching sub-orbital customer flights next year. While that may be true, research does show that space travel will probably be physically manageable for your average, untrained human. “Normal people can go into outer space,” Tony Antonelli, Lockheed Martin Corp.’s chief technologist for space exploration and a former Space Shuttle pilot, said in September at the 68th International Astronautical Congress in Australia. Indeed, Americans became aware long ago that scientists, elderly politicians and even school teachers could meet all the requirements of a Space Shuttle mission—having the [“The Right Stuff”](https://www.theguardian.com/books/2016/mar/14/100-best-nonfiction-no-7-right-stuff-tom-wolfe) didn’t require you to be Chuck Yeager. But those astronauts still went through NASA’s formidable training; much less physical preparation will be provided passengers who hop aboard a commercial flight. And whether they can handle the psychological stress remains an open question. For decades, human space flight has rested squarely in the government’s domain. Fewer than 600 people have escaped Earth’s grasp, almost all of them public employees. Membership in that exclusive club is poised to surge as entrepreneurs line up to create this new form of adventure ride: the ultimate roller coaster. The U.S. government is giving the nascent industry wide latitude, in part to encourage commercial enterprise and also because there’s little stomach for funding a national space program. Congress has allowed companies to devise their own medical screening and training protocols by imposing a moratorium on space passenger regulation until 2023. The Federal Aviation Administration currently requires a license for non-governmental space flights to ensure they don’t pose a hazard to public safety. But the FAA doesn’t have authority over vehicle design or training—or who springs for a seat on these new space ventures. “It’s really up to the company for what kind of screening they want to have,” George Nield, the FAA’s associate administrator for commercial space transportation, said Tuesday at the annual Space Commerce Conference in Houston. If all goes as planned, the commercial space race will introduce scores of new “astronauts” each year: mostly middle-aged and older people with plenty of cash to burn—as well as run-of-the mill maladies that come with age. This situation, novel to space travel, has led researchers to probe the average person’s vulnerabilities in such an environment, contributing to a growing body of research about the stresses of rocket flight for those without a NASA-certified physique. “When I started this 10 years ago, I was pretty skeptical,” said Vanderploeg, who is also executive director of aerospace medicine at Baylor College of Medicine in Houston. After years of study that involved spinning people of all ages in a centrifuge to replicate extreme gravitational stress (or G-force), he said, “What we found was that most people would do just fine.” Does this mean space travelers with heart disease or diabetes, pacemakers or insulin pumps, or any chronic affliction that comes with old age could pass muster? Potentially, yes. The primary medical-screening issue, Vanderploeg said, is whether a flier’s condition is “well-understood and well-controlled” and the person is receiving the appropriate treatment. There’s an economic imperative at work here, too. Holding passengers to the same standards as those that faced traditional astronauts may not result in many paying customers, a critical point when you consider the open question as to whether commercial space flight will ever turn a profit. Nevertheless, Virgin Galactic LLC takes a conservative view toward screening its customers, Vanderploeg said. The first 100 customers, which the company calls “founders,” have received extensive medical scrutiny ahead of the first space flights. “I have never felt any pressure to say yes to fly somebody, or to keep them in the customer queue, who I was uncomfortable with from a medical point of view,” Vanderploeg said. “Flying or not flying a single individual is not financially significant,” he said, given the enormous capital and research investments the industry has made, and the many risks involved. Certainly, an in-flight heart attack or stroke would be a public relations disaster for this new mode of travel, in which safety is already of paramount concern. After all, the track record of U.S. human spaceflight has shown that dying on a rocket is 10,000 times more likely than getting killed on a commercial aircraft, so the physical risk is there for everyone to see. Nevertheless, research shows that the real danger for passengers may not be physical at all. While blood pressure and heart disease can be documented and managed, the larger challenge for newbie astronauts may come from plain old anxiety. Professionals have historically gone through comprehensive psychological vetting, and often come from military backgrounds in which they learned to handle combat conditions. Not so with everyday folks looking for a fun ride: Though commercial trips will initially be short, a passenger “freaking out” on a 20-minute flight could cause serious problems for all aboard. Research has found that “the typical anxiety questionnaires and psychological surveys and so forth that one uses didn’t predict well at all who might be anxious and potentially present a problem,” Vanderploeg said. That means a space carrier will probably need to observe customers closely during pre-flight training, which for Virgin Galactic is expected to last three days at its future home, [Spaceport America](https://spaceportamerica.com/) in New Mexico. Blue Origin LLC—which is backed by the world’s richest person, Amazon.com Inc. founder Bezos—is planning 11-minute flights on its [New Shepard](https://www.blueorigin.com/new-shepard) autonomous vehicle from its site in West Texas; it has not yet disclosed a fare or when it expects to begin customer trips. The company, based in suburban Seattle, has said its training program will last about 1 1/2 days at its launch facility. Bezos and his deputies expressed confidence that such passenger issues can be avoided. “The system has been designed from the very beginning so that the [training can be minimal](https://www.nbcnews.com/mach/space/here-s-what-space-tourists-can-expect-while-board-blue-n745756),” Bezos said in April at an industry symposium. “You have to know how to strap yourself in and a few other things. But it’s not a significant amount of training.” “We think it’s going to cover exactly what you need for the 11 minutes,” Ariane Cornell, Blue Origin’s head of business development and strategy, said at the September space conference in Australia. One thing is for certain: These very short trips into space won’t be priced for the budget-minded. Virgin Galactic is charging $250,000 for its two-hour journeys, which will carry two pilots and six passengers. Other potential space options aren’t likely to be cheap, either. Boeing Co. is building a human-rated vehicle, the [CST-100 Starliner](http://www.boeing.com/space/starliner/), for NASA [supply missions](https://www.bloomberg.com/news/articles/2017-10-13/americans-will-head-to-space-again-without-a-russian-taxi), one that may also be used for future commercial activities. Musk’s SpaceX has a deal with NASA to fly astronauts to the space station aboard its Crew Dragon; it also has contracts with two private citizens to fly them [around the moon](https://www.bloomberg.com/news/articles/2017-02-27/musk-s-spacex-plans-to-send-two-private-citizens-to-moon-in-2018). SpaceX hasn’t revealed whom it will fly or the price for the lunar trip. Two other human space vehicles are in development, from Lockheed and Sierra Nevada Corp. Both craft are under NASA contract but have potential commercial applications. For Virgin Galactic’s proposed [journey](https://www.virgingalactic.com/human-spaceflight/our-vehicles/), a Virgin aircraft called White Knight Two will carry the vehicle, called SpaceShipTwo, to 50,000 feet before releasing it. A rocket will then ignite to carry passengers roughly 62 miles above Earth, into weightlessness and across what is considered the (somewhat arbitrary) boundary between the atmosphere and space. The launch phase is expected to exert about 3.5G’s of force for 15 seconds, or 3.5 times the weight you feel from gravity while on the planet’s surface. Re-entry stress will be slightly higher, at 4-6G’s for 15 to 20 seconds. Passengers will be trained how to breathe through these periods. Cabin seats will shift for both acceleration and re-entry to mitigate the force of gravity; occupants are not expected to lose consciousness. In a promotional [video](https://www.virgingalactic.com/human-spaceflight/training/), Virgin’s chief astronaut trainer, Beth Moses, said the company’s goal is to keep its customers from not “reacting to what has just happened” but rather to be prepared for “savoring everything that’s going on.” One unavoidable sacrifice all passengers will have to make, however, is the ability to relieve themselves. There won’t be a restroom on the Virgin Galactic, Boeing or Blue Origin vessels. “We have many things to offer, but a good commode is not one of them,” said Richard DalBello, Virgin’s vice president of business development and government affairs, during a panel at the September conference. Beyond physical, or even psychological fitness, future passengers will need to consider something even more basic: the overall risks inherent to space flight. On the Space Shuttle program, NASA experienced two major fatal accidents—the destruction of the Challenger just after liftoff in 1986 and the Columbia upon re-entry in 2003—out of 135 launches. NASA’s current commercial crew program, which involves the Boeing and SpaceX vehicles, prescribes a 1-in-270 chance of death, estimating it as roughly four times safer than the shuttle, said David Klaus, an aerospace engineering professor at the University of Colorado at Boulder, who has researched space risks. The [risk](http://www.coe-cst.org/core/scripts/wysiwyg/kcfinder/upload/files/YR%206_ES_2017_02_2_Final_Rev1.pdf) is roughly equivalent to that of climbing Mount Everest, according to an FAA-funded analysis by Klaus and other researchers, which is a little more than a 1 percent chance of [not making it back](https://www.sciencedaily.com/releases/2008/12/081209221709.htm). That’s pretty much the same odds American astronauts have faced up until now. In the U.S., 375 human space flights over the past 50 years have resulted in four fatal accidents, including a 1967 crash of the X-15 hypersonic rocket plane, the two shuttle losses and the October 2014 crash of a Virgin Galactic spacecraft in California. That’s about a 1 percent fatal accident rate, the FAA’s Nield said at the September conference in Australia. “That’s something we want to improve upon,” he said. Safety isn’t likely to be compromised by any of the space-faring upstarts, Klaus said. But the question remains for each business: “How safe is safe enough?” he asked. “There’s no good engineering answer to that. It’s a question that’s easy to ask and very difficult to answer.” “I think it’s safe to presume that accidents will occur,” said Michelle Hanlon, an attorney specializing in aviation and space law with consulting firm ABH Aerospace LLC. Passengers will undoubtedly be required to sign waivers preventing them or their survivors from suing, she said. Part of the notion of “informed consent” is that a participant actually understands the risks before agreeing to accept them, according to FAA regulations for human spaceflight. Nevertheless, Hanlon said, no waiver will prevent someone from trying to sue when the worst happens. Lawyers will argue that “the consent was marred because it didn’t explicitly state this or it didn’t explicitly state that,” Hanlon said. “You’re going to end up in court—definitely.”

#### 3. Space fails—

#### a. Biology and structural issues.

Stross 7 (Charlie, gradutated from the University of Bradford, degrees in pharmacy and computer science, worked as a technical author, a freelance journalist, a programmer and a pharmacist at different times, author of six Hugo-nominated novels and winner of the 2005 and 2010 Hugo awards for best novella. "The High Frontier, Redux," http://www.antipope.org/charlie/blog-static/2007/06/the\_high\_frontier\_redux.html)

But when we start examining the prospects for interplanetary colonization things turn gloomy again. Bluntly, we're not going to get there by rocket ship.Optimistic projects suggest that it should be possible, with the low cost rockets currently under development, to maintain a Lunar presence for a transportation cost of roughly $15,000 per kilogram. Some extreme projections suggest that if the cost can be cut to roughly triple the cost of fuel and oxidizer (meaning, the spacecraft concerned will be both largely reusable and very cheap) then we might even get as low as $165/kilogram to the lunar surface. At that price, sending a 100Kg astronaut to Moon Base One looks as if it ought to cost not much more than a first-class return air fare from the UK to New Zealand ... except that such a price estimate is hogwash. We primates have certain failure modes, and one of them that must not be underestimated is our tendency to irreversibly malfunction when exposed to climactic extremes of temperature, pressure, and partial pressure of oxygen. While the amount of oxygen, water, and food a human consumes per day doesn't sound all that serious — it probably totals roughly ten kilograms, if you economize and recycle the washing-up water — the amount of parasitic weight you need to keep the monkey from blowing out is measured in tons. A Russian Orlan-M space suit (which, some would say, is better than anything NASA has come up with over the years — take heed of the pre-breathe time requirements!) weighs 112 kilograms, which pretty much puts a floor on our infrastructure requirements. An actual habitat would need to mass a whole lot more. Even at $165/kilogram, that's going to add up to a very hefty excess baggage charge on that notional first class air fare to New Zealand — and I think the $165/kg figure is in any case highly unrealistic; even the authors of the article I cited thought $2000/kg was a bit more reasonable. Whichever way you cut it,sending a single tourist to the moon is going to costnot less than $50,000 — and a more realistic figure, for a mature reusable, cheap, rocket-based lunar transport cycle is more like $1M. And that's before you factor in the price of bringing them back ... The moon is about 1.3 light seconds away. If we want to go panning the (metaphorical) rivers for gold, we'd do better to send teleoperator-controlled robots; it's close enough that we can control them directly, and far enough away that the cost of transporting food and creature comforts for human explorers is astronomical. There probably are niches for human workers on a moon base, but only until our robot technologies are somewhat more mature than they are today; Mission Control would be a lot happier with a pair of hands and a high-def camera that doesn't talk back and doesn't need to go to the toilet or take naps.When we look at the rest of the solar system, the picture is even bleaker. Mars is ... well, the phrase "tourist resort" springs to mind, and is promptly filed in the same corner as "Gobi desert". As Bruce Sterling has puts it: "I'll believe in people settling Mars at about the same time I see people settling the Gobi Desert. The Gobi Desert is about a thousand times as hospitable as Mars and five hundred times cheaper and easier to reach. Nobody ever writes "Gobi Desert Opera" because, well, it's just kind of plonkingly obvious that there's no good reason to go there and live. It's ugly, it's inhospitable and there's no way to make it pay. Mars is just the same, really. We just romanticize it because it's so hard to reach." In other words, going there to explore is fine and dandy — our robots are all over it already.But as a desirable residential neighbourhood it has some shortcomings, starting with the slight lack of breathable air and the sub-Antarctic nighttime temperatures and the Mach 0.5 dust storms, and working down from there.Actually, there probably is a good reason for sending human explorers to Mars. And that's the distance: at up to 30 minutes, the speed of light delay means that remote control of robots on the Martian surface is extremely tedious. Either we need autonomous roots that can be assigned tasks and carry them out without direct human supervision, or we need astronauts in orbit or on the ground to boss the robot work gangs around. On the other hand, Mars is a good way further away than the moon, and has a deeper gravity well. All of which drive up the cost per kilogram delivered to the Martian surface. Maybe FedEx could cut it as low as $20,000 per kilogram, but I'm not holding my breath. Let me repeat myself: we are not going there with rockets. At least, not the conventional kind — and while there may be a role for nuclear propulsion in deep space, in general there's a trade-off between instantaneous thrust and efficiency; the more efficient your motor, the lower the actual thrust it provides. Some technologies such as the variable specific impulse magnetoplasma rocket show a good degree of flexibility, but in general they're not suitable for getting us from Earth's surface into orbit — they're only useful for trucking things around from low earth orbit on out. Again, as with interstellar colonization, there are other options. Space elevators, if we build them, will invalidate a lot of what I just said. Some analyses of the energy costs of space elevators suggest that a marginal cost of $350/kilogram to geosynchronous orbit should be achievable without waving any magic wands (other than the enormous practical materials and structural engineering problems of building the thing in the first place). So we probably can look forward to zero-gee vacations in orbit, at a price. And space elevators are attractive because they're a scalable technology; you can use one to haul into space the material to build more. So, long term, space elevators may give us not-unreasonably priced access to space, including jaunts to the lunar surface for a price equivalent to less than $100,000 in today's money. At which point, settlement would begin to look economically feasible, except ...We're human beings. We evolved to flourish in a very specific environment that covers perhaps 10% of our home planet's surface area. (Earth is 70% ocean, and while we can survive, with assistance, in extremely inhospitable terrain, be it arctic or desert or mountain, we aren't well-adapted to thriving there.)Space itself is a very poor environment for humans to live in. A simple pressure failure can kill a spaceship crew in minutes. And that's not the only threat. Cosmic radiation poses a serious risk to long duration interplanetary missions, and unlike solar radiation and radiation from coronal mass ejections the energies of the particles responsible make shielding astronauts extremely difficult. And finally, there's the travel time. Two and a half years to Jupiter system; six months to Mars. Now, these problems are subject to a variety of approaches — including medical ones: does it matter if cosmic radiation causes long-term cumulative radiation exposure leading to cancers if we have advanced side-effect-free cancer treatments? Better still, if hydrogen sulphide-induced hibernation turns out to be a practical technique in human beings, we may be able to sleep through the trip. But even so, when you get down to it,there's not really any economically viable activity on the horizon for people to engage in that would require them to settle on a planet or asteroid and live there for the rest of their lives.In general, when we need to extract resources from a hostile environment we tend to build infrastructure to exploit them (such as oil platforms) but we don't exactly scurry to move our families there. Rather, crews go out to work a long shift, then return home to take their leave. After all, there's no there there — just a howling wilderness of north Atlantic gales and frigid water that will kill you within five minutes of exposure. And that, I submit, is the closest metaphor we'll find for interplanetary colonization. Most of the heavy lifting more than a million kilometres from Earth will be done by robots, overseen by human supervisors who will be itching to get home and spend their hardship pay. And closer to home, the commercialization of space will be incremental and slow, driven by our increasing dependence on near-earth space for communications, positioning, weather forecasting, and (still in its embryonic stages) tourism.But the domed city on Mars is going to have to wait for a magic wand or two to do something about the climate, or reinvent a kind of human being who can thrive in an airless, inhospitable environment.

#### b. Physics—energy and distance.

Stross 7 (Charlie, gradutated from the University of Bradford, degrees in pharmacy and computer science, worked as a technical author, a freelance journalist, a programmer and a pharmacist at different times, author of six Hugo-nominated novels and winner of the 2005 and 2010 Hugo awards for best novella. "The High Frontier, Redux," http://www.antipope.org/charlie/blog-static/2007/06/the\_high\_frontier\_redux.html)

I'm going to take it as read that the idea of space colonization isn't unfamiliar; domed cities on Mars, orbiting cylindrical space habitats a la J. D. Bernal or Gerard K. O'Neill, that sort of thing. Generation ships that take hundreds of years to ferry colonists out to other star systems where — as we are now discovering — there are profusions of planets to explore. And I don't want to spend much time talking about the unspoken ideological underpinnings of the urge to space colonization, other than to point out that they're there, that the case for space colonization isn't usually presented as an economic enterprise so much as a quasi-religious one. "We can't afford to keep all our eggs in one basket" isn't so much a justification as an appeal to sentimentality, for in the hypothetical case of a planet-trashing catastrophe, we (who currently inhabit the surface of the Earth) are dead anyway. The future extinction of the human species cannot affect you if you are already dead: strictly speaking, it should be of no personal concern. Historically, crossing oceans and setting up farmsteads on new lands conveniently stripped of indigenous inhabitants by diseasehas been a cost-effectiveproposition. But the scale factor involved in space travel is strongly counter-intuitive.Here's a handy metaphor: let's approximate one astronomical unit— the distance between the Earth and the sun, roughly 150 million kilometres, or 600 times the distance from the Earth to the Moon —to one centimetre. Got that? 1AU = 1cm. (You may want to get hold of a ruler to follow through with this one.) The solar system is conveniently small. Neptune, the outermost planet in our solar system, orbits the sun at a distance of almost exactly 30AU, or 30 centimetres — one foot (in imperial units). Giant Jupiter is 5.46 AU out from the sun, almost exactly two inches (in old money). We've sent space probes to Jupiter; they take two and a half years to get there if we send them on a straight Hohmann transfer orbit, but we can get there a bit faster using some fancy orbital mechanics. Neptune is still a stretch — only one spacecraft, Voyager 2, has made it out there so far. Its journey time was 12 years, and it wasn't stopping. (It's now on its way out into interstellar space, having passed the heliopause some years ago.) The Kuiper belt, domain of icy wandering dwarf planets like Pluto and Eris, extends perhaps another 30AU, before merging into the much more tenuous Hills cloud and Oort cloud, domain of loosely coupled long-period comets. Now for the first scale shock: using our handy metaphor the Kuiper belt is perhaps a metre in diameter. The Oort cloud, in contrast, is as much as 50,000 AU in radius — its outer edge lies half a kilometre away. Got that? Our planetary solar system is 30 centimetres, roughly a foot, in radius. But to get to the edge of the Oort cloud, you have to go half a kilometre, roughly a third of a mile. Next on our tour is Proxima Centauri, our nearest star. (There might be a brown dwarf or two lurking unseen in the icy depths beyond the Oort cloud, but if we've spotted one, I'm unaware of it.) Proxima Centauri is 4.22 light years away.A light year is 63.2 x 103 AU, or 9.46 x 1012 Km. So Proxima Centauri, at 267,000 AU, is just under two and a third kilometres, or two miles (in old money) away from us. But Proxima Centauri is a poor choice, if we're looking for habitable real estate. While exoplanets are apparently common as muck, terrestrial planets are harder to find; Gliese 581c, the first such to be detected (and it looks like a pretty weird one, at that), is roughly 20.4 light years away, or using our metaphor, about ten miles. Try to get a handle on this:it takes us 2-5 years to travel two inches. But the proponents of interstellar travel are talking about journeys of ten miles.That's the first point I want to get across: that if the distances involved in interplanetary travel are enormous,and the travel times fit to rival the first Australian settlers, then the distances and times involved in interstellar travel aremind-numbing.This is not to say that interstellar travel is impossible; quite the contrary. Butto do so effectively you need either(a) outrageous amounts of cheap energy, or (b) highly efficient robot probes, or (c) a magic wand. And in the absence of (c) you're not going to get any news back from the other end in less than decades.Even if (a) isachievable, or by means of (b) we can send self-replicating factories and have them turn distant solar systems into hives of industry, and more speculatively find some way to transmit human beings there, they are going to have zero net economic impact on our circumstances (except insofar as sending them out costs us money). What do I mean by outrageous amounts of cheap energy? Let's postulate that in the future, it will be possible to wave a magic wand and construct a camping kit that encapsulates all the necessary technologies and information to rebuild a human civilization capable of eventually sending out interstellar colonization missions — a bunch of self-replicating, self-repairing robotic hardware, and a downloadable copy of the sum total of human knowledge to date. Let's also be generous and throw in a closed-circuit life support system capable of keeping a human occupant alive indefinitely, for many years at a stretch, with zero failures and losses, and capable where necessary of providing medical intervention. Let's throw in a willing astronaut (the fool!) and stick them inside this assembly. It's going to be pretty boring in there, but I think we can conceive of our minimal manned interstellar mission as being about the size and mass of a Mercury capsule. And I'm going to nail a target to the barn door and call it 2000kg in total. (Of course we can cut corners, but I've already invoked self-replicating robotic factories and closed-cycle life support systems, and those are close enough to magic wands as it is. I'm going to deliberately ignore more speculative technologies such as starwisps, mind transfer, or AIs sufficiently powerful to operate autonomously — although I used them shamelessly in my novel Accelerando. What I'm trying to do here is come up with a useful metaphor for the energy budget realistically required for interstellar flight.) Incidentally, a probe massing 1-2 tons with an astronaut on top is a bit implausible, but a 1-2 ton probe could conceivably carry enough robotic instrumentation to do useful research, plus a laser powerful enough to punch a signal home, and maybe even that shrink-wrapped military/industrial complex in a tin can that would allow it to build something useful at the other end. Anything much smaller, though, isn't going to be able to transmit its findings to us — at least, not without some breakthroughs in communication technology that haven't shown up so far. Now, let's say we want to deliver our canned monkey to Proxima Centauri within its own lifetime. We're sending them on a one-way trip, so a 42 year flight time isn't unreasonable. (Their job is to supervise the machinery as it unpacks itself and begins to brew up a bunch of new colonists using an artificial uterus. Okay?) This means they need to achieve a mean cruise speed of 10% of the speed of light. They then need to decelerate at the other end. At 10% of c relativistic effects are minor — there's going to be time dilation, but it'll be on the order of hours or days over the duration of the 42-year voyage. So we need to accelerate our astronaut to 30,000,000 metres per second, and decelerate them at the other end. Cheating and using Newton's laws of motion, the kinetic energy acquired by acceleration is 9 x 1017 Joules, so we can call it 2 x 1018 Joules in round numbers for the entire trip. NB: This assumes that the propulsion system in use is 100% efficient at converting energy into momentum, that there are no losses from friction with the interstellar medium, and that the propulsion source is external — that is, there's no need to take reaction mass along en route. So this is a lower bound on the energy cost of transporting our Mercury-capsule sized expedition to Proxima Centauri in less than a lifetime. To put this figure in perspective, the total conversion of one kilogram of mass into energy yields 9 x 1016 Joules. (Which one of my sources informs me, is about equivalent to 21.6 megatons in thermonuclear explosive yield). So we require the equivalent energy output to 400 megatons of nuclear armageddon in order to move a capsule of about the gross weight of a fully loaded Volvo V70 automobile to Proxima Centauri in less than a human lifetime. That's the same as the yield of the entire US Minuteman III ICBM force. For a less explosive reference point, our entire planetary economy runs on roughly 4 terawatts of electricity (4 x 1012 watts). So it would take our total planetary electricityproductionfora period of half a million seconds — roughly 5 days — to supply the necessaryva-va-voom. But to bring this back to earth with a bump, let me just remind you that this probe is so implausibly efficient that it's veering back into "magic wand" territory. I've tap-danced past a 100% efficient power transmission system capable of operating across interstellar distances with pinpoint precision and no conversion losses, and that allows the spacecraft on the receiving end to convert power directly into momentum. This is not exactly like any power transmission system that anyone's built to this date, and I'm not sure I can see where it's coming from. Our one astronaut, 10% of c mission approximates well to an unmanned flight, but what about longer-term expeditions? Generation ships are a staple of SF; they're slow (probably under 1% of c) and they carry a self-sufficient city-state.The crewwho set offwon't live to see their destination (the flight time to Proxima Centauri at 1% of c is about 420 years), but the vague hope is that someone will. Leaving aside our lack of a proven track record at building social institutions that are stable across time periods greatly in excess of a human lifespan, using a generation ship probably doesn't do much for our energy budget problem either.A society of human beings are likely to need more space and raw material to do stuff with while in flight; sticking a solitary explorer in a tin can for forty-something years is merely cruel and unusual, but doing it to an entire city for several centuries probably qualifies as a crime against humanity.We therefore need to relax the mass constraint. Assuming the same super-efficient life support as our solitary explorer, we might postulate that each colonist requires ten tons of structural mass to move around in. (About the same as a large trailer home. For life.) We've cut the peak velocity by an order of magnitude, but we've increased the payload requirement by an order of magnitude per passenger — and we need enough passengers to make a stable society fly. I'd guess a sensible lower number would be on the order of 200 people, the size of a prehistoric primate troupe. (Genetic diversity? I'm going to assume we can hand-wave around that by packing some deep-frozen sperm and ova, or frozen embryos, for later reuse.) By the time we work up to a minimal generation ship (and how minimal can we get, confining 200 human beings in an object weighing aout 2000 tons, for roughly the same period of time that has elapsed since the Plymouth colony landed in what was later to become Massachusetts?) we're actually requiring much more energy than our solitary high-speed explorer. And remember,this is only what it takes to go toProxima Centauriour nearest neighbour.Gliese 581c is five times as far away. Planets that are already habitable insofar as they orbit inside the habitable zone of their star, possess free oxygen in their atmosphere, and have a mass, surface gravity and escape velocity that are not too forbidding, are likely to be somewhat rarer. (And if there is free oxygen in the atmosphere on a planet, that implies something else — the presence of pre-existing photosynthetic life, a carbon cycle, and a bunch of other stuff that could well unleash a big can of whoop-ass on an unprimed human immune system. The question of how we might interact with alien biologies is an order of magnitude bigger and more complex than the question of how we might get there — and the preliminary outlook is rather forbidding.) The long and the short of what I'm trying to get across is quite simply that,in the absence of technology indistinguishable from magic— magic tech that, furthermore, does things that from today's perspective appear to play fast and loose with the laws of physics —interstellar travel for human beings isnear-as-dammit a non-starter. And while I won't rule out the possibility of such seemingly-magical technology appearing at some time in the future, the conclusion I draw as a science fiction writer is that if interstellar colonization ever happens, it will not follow the pattern of historical colonization drives that are followed by mass emigration and trade between the colonies and the old home soil. What about our own solar system? After contemplating the vastness of interstellar space, our own solar system looks almost comfortingly accessible at first. Exploring our own solar system is a no-brainer: we can do it, we are doing it, and interplanetary exploration is probably going to be seen as one of the great scientific undertakings of the late 20th and early 21st century, when the history books get written.

#### 4. If we win our thesis that capitalism is what causes environmental degradation that means we resolves any need to get off the rock. Climate change in the current system causes extinction—

#### a. Climate change is the largest impact because it triggers all other impacts

Facts to Exist 16 Experts Agree: Climate Change is the Most Serious of All Threats Facing the Planet, http://www.fastcoexist.com/3055503/experts-agree- climate-change- is-the- most- serious-of- all-the- threats-facing- the-planet DOA: 1-20- 16

To hear some presidential candidates on the campaign trail, climate change is nothing to worry about—a hoax foisted on the American public as part of some government conspiracy. But that’s not how it’s seen by 750 experts from business, academia, civil society and the public sector. Surveyed by the World Economic Forum for its latest Global Risks report, the respondents rank climate change as the gravest threat facing the planet over the next decade. In its potential impact, it’s a more serious problem than weapons of mass destruction, cyberwar, terrorism, interstate conflicts, and every other conceivable menace. One reason climate change figures strongly is that it feeds into other problems. “Climate change is exacerbating more risks than ever before in terms of water crises, food shortages, constrained economic growth, weaker societal cohesion and increased security risks,” says Cecilia Reyes, chief risk officer at Zurich Insurance, a major reinsurance group. It’s the first time an environmental challenge has topped the list in 11 years the WEF has been publishing its risk analysis. Weapons of mass destruction was rated the second most impactful problem, followed by water crises. The experts also rated risks by their likelihood in the coming year. Large-scale involuntary migration tops the list (one in 122 people worldwide are now displaced), followed by extreme weather events, and, again, climate change (or as the report puts it, the failure to mitigate and adapt to climate change The report discusses how rising temperatures and extreme weather events could affect agricultural productivity and disrupt food supply chains. For example, based on current trends, Sub-Saharan Africa is forecast to see a 40% loss of suitable land to grow maize by 2030, the report says. It calls for more investment in climate- resistant crops (like corn that needs less water to grow) and new types of insurance for farmers so they can invest in agriculture with greater confidence.

#### b. Historical Evidence Proves; Climate Change Leads to Mass Extinction

**Meissner and Alexander, March 23, 2016 -** Associate Professor, Climate Change Research Centre, UNSW Austral [Kaitlin Alexander](http://theconversation.com/profiles/kaitlin-alexander-243871) PhD Candidate, Climate Change Research Centre, UNSW; ARC Centre of Excellence for Climate System Science, UNSW Australia

(Meissner and Kaitlyn, The Conversation, “Mass extinctions and climate change: why the speed of rising greenhouse gases matter.” http://theconversation.com/mass-extinctions-and-climate-change-why-the-speed-of-rising-greenhouse-gases-matters-56675)

We now know that greenhouse gases are rising faster than at any time since the demise of dinosaurs, and possibly even earlier. According to [research published in Nature Geoscience](http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo2681.html) this week, carbon dioxide (CO₂) is being added to the atmosphere at least ten times faster than during a major warming event about 50 million years ago. We have emitted almost [600 billion tonnes of carbon since the beginning of the Industrial Revolution](http://www.trillionthtonne.org/), and atmospheric CO₂ concentrations are now [increasing at a rate of 3 parts per million (ppm) per year](http://www.esrl.noaa.gov/gmd/ccgg/trends/gr.html). With increasing CO₂ levels, temperatures and [ocean acidification](https://theconversation.com/au/topics/ocean-acidification) also rise, and it is an open question how ecosystems are going to cope under such rapid change. [Coral reefs](https://theconversation.com/coral-bleaching-comes-to-the-great-barrier-reef-as-record-breaking-global-temperatures-continue-56570), our canary in the coal mine, suggest that the present rate of climate change is too fast for many species to adapt: [the next widespread extinction event might have already started](http://science.sciencemag.org/content/345/6195/401). In the past, rapid increases in greenhouse gases have been associated with mass extinctions. It is therefore important to understand how unusual the current rate of atmospheric CO₂ increase is with respect to past climate variability.

#### c. Warming causes resource competition which leads to war.

Climate Central 13, (Andrew Ward, " Climate & Conflict: Warmer World May be More Violent," 8/1/13, <http://www.climatecentral.org/news/a-warmer-world-likely-to-be-a-more-violent-world-study-shows-16299)> TZ

Global warming may be ratcheting up the odds for violence at the local, regional, and international scales, from inner-city America to the arid plains of Africa, according to a comprehensive new study published Thursday. The study, published in the journal Science, concludes that climate events from heat waves to droughts and floods have strong links to violent conflicts, helping to explain patterns of crime, civil wars, and even the collapse of some ancient civilizations. The study draws on a broad body of evidence from fields as disparate as archaeology and political science that show a causal and often substantial connection between climate and those events. A Sudanese woman and children are pictured in Fanga Suk in East Jebel Marra, South Darfur. Credit: United Nations Photo by Olivier Chassot. The report, which took a sweeping view of 60 previously published studies on climate and conflict, found that the size of climate’s influence on conflict is larger than most previous studies had estimated, although the authors cautioned that climate is not necessarily the biggest factor driving violence in most situations. Written by researchers at Princeton University and the University of California at Berkeley, the study found that when the climate deviates far from average conditions, the risk of many types of conflict increases. “The central finding of the study is the link — the very strong link — we find between adverse climate and more violence, more human conflict,” said co-author Edward Miguel, of U.C. Berkeley, in an interview. “We establish that link looking at a much broader set of studies than others have before.” To put it more technically, the study found that for each one standard deviation change in the climate toward warmer average temperatures or more extreme rainfall, the median estimate of the frequency of intergroup conflict — i.e. civil war — rises by 14 percent, while the frequency of interpersonal conflict increases by 4 percent. “For a sense of scale, this kind of temperature change is roughly equal to warming an African country by 0.6°F for an entire year, or warming a U.S. county by 5°F for a given month. These are moderate changes, but they have a sizable impact on societies,” said study co-author Marshall Burke of U.C. Berkeley, in a press release. Given that climate projections show that many parts of the world are expected to at least double that amount of warming by 2050, the findings strongly suggest that barring other mitigating factors, a warmer world will also be a more violent one. Zambian peacekeepers from the United Nations Mission in Sudan (UNMIS) patrol streets lined with looted items awaiting collection in Abyei, the main town of the disputed Abyei area on the border of Sudan and newly independent South Sudan. Credit: United Nations Photo by Stuart Price. There are numerous recent conflicts that studies have linked to climate extremes, including the Arab Spring that began two years ago, genocide in Darfur, and the ongoing Syrian civil war. In the case of Syria, for example, a major drought and sharp spike in food prices, along with reduced access to water and power supplies preceded the uprising against the regime of president Bashar Al-Assad, and similar climate-related food price spikes played out in Egypt and Tunisia prior to the ouster of longtime governments in those countries. Lack of consistent access to water may contribute to more conflicts in the future, with increasingly strained water resources in coming decades due to burgeoning populations and drought. Climate studies show that drought is projected to increase in frequency and severity in some parts of the world that are experiencing high rates of population growth, such as the Middle East and parts of Africa. The research is the first to reexamine the available evidence on climate and conflict, which has at times been a contentious subject within the scientific community. The results dramatically depart from prior research that said the relationship between global warming and conflict is contradictory and inconclusive. The Cal-Berkeley team found that all 27 studies dealing with modern societies found a relationship between higher temperatures and greater violence. Experts in the field who were not involved in the study said its findings are groundbreaking. “I think it’s a path-breaking study that lays to rest a lot of the earlier, slightly misinformed, debate and confusion,” said Marc Levy, deputy director of the International Earth Science Information Network at Columbia University. Levy said the study shows that climate is clearly a driver of violence, but not the main driver in most cases, given the many other contributing factors to conflict, from ethnic rivalries to economic development and political repression. He said previous studies that had looked at individual conflicts and individual climate factors resulted in a “cacophony” of seemingly disparate results. These four maps illustrate the increased potential for future drought worldwide over the decades indicated, based on current projections of future greenhouse gas emissions. The maps use a common measure, the Palmer Drought Severity Index, which assigns positive numbers when conditions are unusually wet for a particular region, and negative numbers when conditions are unusually dry. Click image to enlarge. Credit: NCAR. “It’s really, really difficult to find a smoking gun, to find a climate stress in a conflict and say definitively that in the absence of climate stress this conflict wouldn’t have occurred,” he said in an interview. Levy said the study demonstrates where the social and physical science communities are headed on the climate and conflict nexus, with more researchers becoming convinced that the evidence is far stronger than it was just a few years ago. “Many more people are falling into the camp that the evidence is definitive,” Levy said. Thomas Homer-Dixon, a professor at the University of Waterloo in Canada, said the study presents a compelling case for a robust link between climatic stress and violence, while being careful to acknowledge that climate change is but one of many factors that can increase the likelihood of violence. “The paper’s conclusions are dramatic in terms of their implications for policy and for humankind more generally, but they’re not sensationally stated,” Homer-Dixon said in an email conversation. “The paper is well-caveated, with clear acknowledgments of areas where future research is necessary. “What does it all mean? The world will be a very violent place by mid-century if climate change continues as projected. Climate change will increase the likelihood that large zones of the world will see central institutions disintegrate and evolve into a form of chronic security anarchy — think Somalia, Yemen, western Pakistan, eastern Congo, etc.” Not everyone is convinced by the new research, however. “I struggle to see how the authors can claim a remarkable convergence of quantitative evidence when one-third of their civil conflict models produce a climate effect statistically indistinguishable from zero, and several other models disagree on the direction of a possible climate effect,” said Halvard Buhaug, research director at the Peace Research Institute in Oslo whose work has cast doubt on ties between climate extremes and conflict. “Surprisingly, the authors provide no examples of real conflicts that plausibly were affected by climate extremes that could serve to validate their conclusion. For these and other reasons, this study fails to provide new insight into how and under what conditions climate might affect violent conflict,” he said in an email conversation. The new study is what is known as a “meta analysis,” and it took the data from numerous prior studies and examined them collectively using state of the art statistical methods that were unavailable to researchers until relatively recently, thereby drawing conclusions from a far larger dataset than the individual studies themselves. In total, the research contains the results of a comprehensive review of the available data put forward by 60 prior studies of climate from 190 researchers in various disciplines, including data on violence dating from 10,000 B.C.E. to the present day, extending across all regions of the globe. Reflecting the growth of research on this topic in recent years, 78 percent of the studies were published since 2009. The study incorporated findings from research on domestic violence, street crime, rioting, civil war, all the way to the collapse of entire civilizations. To compare all the datasets from individual studies, the researchers first standardized the information using a measure of normal climate variability, known as the standard deviation unit. Miguel likened this process to “converting weather variables into a common currency.” Next, in order to reduce the margin of error, the researchers pooled the standardized data together in a way that is similar to how a political pollster might average a group of polls to accurately predict the outcome of a presidential election, rather than relying on just one or two polls to get a snapshot of the race. These methods allowed the researchers to analyze separate data sets that would otherwise make for “apples to oranges” comparisons. A deserted drought-stricken village in Mauritania seen in 2011. Credit: United Nations Photo by John Isaac. Among climate change-related factors, the study found that temperature has a larger effect on violence, particularly intergroup violence, than precipitation, although both clearly influence the odds of violence. In order to prevent such a bleak future, researchers and policymakers face a daunting task, since knowing that climate change affects violence is not enough to create better early warning systems or develop violence-prevention strategies. “We can’t just stick with the status quo,” Miguel said. “Our study suggests that if we stick with the status quo we’re going to have a lot more violence.” To devise successful strategies that reduce the risk of future violence, scientists need to determine the causal pathways through which climate influences conflict. For example, it could be through economic factors, with a drought reducing farmers’ income and, at the same time, increasing food prices that further stress society. Policymakers also need to put in place tools to anticipate and prevent conflict. “We’re in the same position that medical researchers were in during the 1930s: they could find clear statistical evidence that smoking tobacco was a proximate cause of lung cancer, but they couldn’t explain why until many years later. In the same way, we can show that climatic events cause conflict, but we can’t yet say exactly why,” said lead author Solomon Hsiang of Princeton University (now at U.C. Berkeley), in a press release. The evidence regarding the link between climate change and conflict is solid enough to have motivated the U.S. national security establishment, spurring research projects at the CIA, the Defense Advanced Research Projects Agency, and other agencies. The 2010 Quadrennial Defense Review, and the 2010 National Security Strategy identified climate change as a threat to U.S. national security, in part, because of its potential to foment political instability in strategically important regions, such as the Middle East. A CIA-funded study published in 2012 found that climate extremes, such as droughts and heat waves, are already exacerbating tensions in parts of the world. A promising avenue for early warning systems may be through the use of big data. Those approaches would combine various social indicators, such as the average income of a country, with environmental monitoring data, such as satellite imagery showing vegetation health, to detect areas at higher risk of climate change-related violence. Some of those efforts are already underway. A Pentagon-sponsored research group that Columbia’s Levy is advising is trying to combine social media data mining with remote sensing data from satellites and other tools to identify potential pressures on social stability in the so-called “megacities” of the world, with populations of greater than 10 million. “I think we’re still in the early days of being able to take all these potential technologies and turn them into reliable, actionable early warning systems,” Levy said. “We’re much, much closer than we were five years ago.”