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Rapid Loss of Habitat for Homo sapiens

Guy McPherson

Overview

Earth is in the midst of abrupt and apparently irreversible climate change (McPherson, 2020a). The ongoing rate of temperature rise indicates that the climate of Earth will resemble that of the Pliocene Epoch as early as 2030 (Burke et al., 2018). The mid-Pliocene was more than 2 C warmer than contemporary Earth, and the rate of change anticipated by Burke et al. (2018) is occurring rapidly enough to assure the inability of vertebrates and mammals to keep up. Even the scientifically conservative Intergovernmental Panel on Climate Change reported on the irreversibility of climate change in September 2019 (IPCC, 2019).

We currently occupy the warmest Earth with *Homo sapiens* present (Hansen et al., 2017). There is no demonstrated approach or combination of approaches by which the global-average temperature of Earth can be stabilized or reduced. However, two ideas that await large-scale testing and implementation are described and recommended herein.

The projected rate of climate change in the future, based on the gradualism assumed by the Intergovernmental Panel on Climate Change (IPCC), outstrips the adaptive response of vertebrates by a factor of 10,000 times (Quintero and Wiens, 2013). Similarly, mammals cannot evolve rapidly enough to escape the current extinction crisis (Davis et al., 2018). Humans are classified as vertebrate mammals, indicating that we will experience a fate similar to the one faced by an estimated 150-200 species of plants, insects, birds, and mammals each day (United Nations Environment Programme, 2010). In other words, a Mass Extinction Event has been underway for more than a decade.

The observed and projected rates of rapid global-average temperature rise are unprecedented in planetary history (Zhao et al. 2019). Burke et al. (2018) indicate a rapid rise in

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global-average temperature in the near future in an approach that relies upon the Representative Concentration Pathways of the IPCC. As a result, Burke et al. (2018) ignore many self-reinforcing feedback loops and also the aerosol masking effect. In other words, Earth is already in the midst of abrupt climate change, and the pace of global-average temperature rise is expected to accelerate in the near future. There is little question that human animals face an existential threat. Will proposed ideas allow for retention of habitat for our species before we pass even more "tipping points"?

Not only are humans classified as animals, but we depend upon other species for our own continued survival. As stated by Strona and Bradshaw (2018), humans will join the annihilation of "all life on earth." As they write, "in a simplified view, the idea of co-extinction reduces to the obvious conclusion that a consumer cannot survive without its resources."

Habitat is already being lost for humans around the globe as a result of lethal wet-bulb temperatures causing organ failure and therefore death (Raymond et al. 2020). This finding is contrary to the conventional expectation that such events will occur decades in the future. The only question is when, not whether, we will lose habitat on a planetary basis and therefore go extinct. After all, more than 99.9 percent of species to exist on Earth have already gone extinct, a number than includes several species in the genus *Homo*. Climate change has been implicated in the extinction of some of these species (Raia 2020).

In addition to abrupt, irreversible climate change, Earth is also in the midst of a Mass Extinction Event (Ceballos et al. 2017, Ceballos et al. 2020). This event does not lie in the distant future, nor has it begun recently. Rather, it is been under way for at least a decade (United Nations Environment Programme, 2010). Consider, for example, two sentences from the "Significance" section of the paper by Ceballos et al. (2017): "Dwindling population sizes and range shrinkages amount to a massive anthropogenic erosion of biodiversity and of the ecosystem services essential to civilization. This 'biological annihilation' underlines the seriousness for humanity of Earth's ongoing sixth mass extinction event."

Our membership in the animal kingdom comes with the ability to predict that loss of habitat will cause the functional extinction of our species, as with other animals. Such a loss of habitat will make us functionally extinct. Shortly thereafter, our species will disappear from Earth. Those who choose to live in artificial "habitats" such as belowground bunkers will experience an environment rich in ionizing radiation as nuclear power plants melt down uncontrollably, unstable local temperatures, increasing inability to secure clean water and healthy food, and other significant challenges to the continuation of human life.

This current paper describes a few means by which Earth could lose all habitat for *Homo sapiens*, a process that is already under way. Human extinction likely was triggered when Earth exceeded 2 C above the 1750 baseline. After all, an "increase of 1.5 degrees is the

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maximum the planet can tolerate; … at worst, [such a rise in temperature above the 1750 baseline will cause] the extinction of humankind altogether" (Gaub, 2019). In other words, human extinction likely is guaranteed with no further degradation of planetary habitat in the future.

Loss of Habitat

Loss of habitat for human animals is likely to continue in the future. After all, ongoing industrial activity will continue to drive up temperatures as a result of increased greenhouse gases in the atmosphere. The current levels of atmospheric carbon dioxide (more than 415 ppm) and methane (more than 1,500 ppb) assure planetary disaster awaits in the relatively near future. Carbon dioxide and methane are two of more than 40 greenhouse gases overheating Earth.

Paradoxically, human habitat can be lost not only via increased industrial activity, but also via *decreased* industrial activity. The aerosol masking effect, or global dimming, has been described in the peer-reviewed literature for at least 90 years (Ångström, 1929). Coincident with industrial activity adding to greenhouse gases that warm the planet, industrial activity simultaneously *cools* the planet by adding aerosols to the atmosphere. These atmospheric aerosols block incoming sunlight, thereby keeping cool our pale blue dot. Reducing industrial activity by as little as 20 percent could cause a global-average temperature rise of 1 C within a few weeks (as reviewed by McPherson 2020b).

There are additional pathways to loss of habitat for humans on Earth, as described in the following paragraphs. The only means by which planetary temperature can be stabilized are the untested, experimental Hypertopia Option (McMenamin 2019) and the MEER:ReflEction framework described by Tao (2020). Unfortunately, limited funding restricts additional research and implementation of these projects. In addition, they each rely upon continuation of industrial civilization, which is a heat engine (Garrett 2011a, 2011b, 2012, 2014, 2015).

One means by which humans could lose habitat was reported by Shakhova et al. (2008): a burst of methane from beneath the Arctic Ocean. They reported that "up to 50 Gt . . . hydrate storage as highly possible for abrupt release at any time." Such a rapid burst of methane into the atmosphere would cause an abrupt rise in global-average temperature far too rapid for organisms to adapt. Methane is more than 100 times more powerful than carbon dioxide as a greenhouse gas, and the abrupt release of even half the 50 Gt concluded by Shakhova and colleagues would cause loss of habitat for humans within a matter of months. Shakhova et al. (2008) did not indicate that an ice-free Arctic was required for such a release of methane.

The relatively shallow seabed of the Arctic Ocean is not the only source of atmospheric methane on Earth. This potent greenhouse gas is also being released at exceptionally high

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levels from terrestrial permafrost in the Arctic region (Streletskaya et al. 2018).

The ability to grow, store, and distribute grains at scale is a defining element of industrial civilization, as with all civilizations. A significant decline in grain harvest will surely cause a collapse of this version of civilization. The 83.3 percent decline of earthworms in agrichemical fields relative to other areas thus poses a threat to industrial civilization (Blakemore, 2018). The resulting loss of aerosol masking would cause loss of habitat for humans on Earth, as described above.

The looming ice-free Arctic Ocean, incorrectly projected to occur in 2016 + 3 years (Maslowski et al., 2012), will represent the first such event in history. The profoundly negative scientific impacts of this eventuality were summarized by the President of Finland during a press conference with President Donald Trump in August of 2017, and several times since then (Niinistö, 2017): "If we lose the Arctic, we lose the globe. That is reality."

The vortices created by aircraft have been transformed into patterns of semi-permanent atmospheric circulation (Schouw and Pauli, 2019). These vortices "have widespread effects on how the atmosphere traps and releases heat. It is also possible that these changes alter the loss of water from the atmosphere. This would endanger all life on earth, not just the human population." Continuation of commercial air traffic thus joins the factors contributing to a loss of all life on Earth.

Finally, a future El Niño-Southern Oscillation (ENSO) will release heat from the ocean to the terrestrial biosphere, as is typical for ENSO events. An ENSO was incorrectly forecast to occur in the northern hemisphere autumn of 2020 (Ludescher et al. 2013), and it surely lies in the near future. The ocean acts as a "battery" that stores carbon dioxide and heat. The release of heat from the ocean during an ENSO event likely will be sufficient to exacerbate ongoing heat waves and failing production of grain crops. It seems likely that these negative consequences will result in loss of habitat for humans, with extinction soon to follow.

Any series of events that causes the demise of industrial civilization leads, shortly thereafter, to human extinction by two independent means. Firstly, the rapid reduction in aerosol masking associated with a reduction in industrial activity leads directly to loss of habitat for humans and most other organisms on Earth. Secondly, the catastrophic meltdown of the world's nuclear power facilities as essential workers stop working voluntarily – or disappear as a result of human extinction – will lead to lethal mutations resulting from widespread ionizing radiation, thereby threatening all plant life on Earth with extinction (Mousseau and Møller 2020).

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Now What?

The Hypertopia Option (McMenamin 2019) and the MEER:ReflEction framework (Tao 2020) are the only means with which I am familiar that offer a societal path forward. Unfortunately, each of these projects awaits implementation. In addition, they each rely upon continuation of the heat engine of industrial civilization, which suggests they will contribute to additional overheating of Earth. It appears that additional, radical changes in society will be needed if either or both of these two strategies are implemented.

Although the future of humanity might be short and unpleasant, this is no reason for despair. All adults know we will die. Similarly, we have long known that all species go extinct. Our character is defined by how we live in light of the terminal diagnosis we were given at birth.

Many contemporary climate scientists, heads of corporations, and politicians have access to the information I have presented in this paper. However, many of these individuals seem reluctant to share the information, as I have discussed (McPherson 2019a). I suspect the potential loss of privilege associated with sharing existentially dire information contributes to their reticence (McPherson 2019b).

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