Journal of Education and Human Development
March 2022, Vol. 11, No. 1, pp. 1-11
ISSN: 2334-296X (Print), 2334-2978 (Online)

Published by American Research Institute for Policy Development
DOI: 10.15640/jehd.v11n1a1
URL: https://doi.org/10.15640/jehd.v11n1a1

Humanity Faces a Global Life Emergency: We Must Start Teaching Teachers and Students About It

Karl F. Wheatley[1]

Abstract

This review summarizes evidence regarding the urgent existential threats facing humanity, and concludes that education at all levels should start teaching teachers and students about this *global life emergency*. Thereview defines the global life emergency, describes itsten most dangerousenvironmental and societal threats (e.g., climate disruption, loss of biodiversity, breakdown of democracy, vast inequality), and explainshow these threats could collapse ecosystems, society, or both. The scale of the global life emergency is explored, including secondary ripple effects from those ten main threats (e.g., heat waves, droughts, wildfires, sea level rise). The review also discusses why technology is not a panacea, and often does more harm than good. The scale of the global life emergency is illustrated through the massive changes that would be needed in the lifestyle of an average American to bring their individual environmental footprint within their fair share of Earth's annual carrying capacity.What is needed to solve these enormous environmental and social crises simultaneously is a profoundand almost unimaginable transformation of industrialized economies and lifestyles. The case for reorienting education to teach about the life emergency and its solutions is outlined, and common objections to this shift in curricular focus are addressed.

Keywords: educational reform, curricular change, sustainability, social change, teacher education, existential threats

"We are still educating the young as if there were no planetary emergency." - *David Orr*

The health of society and Earth's ecosystems are starting to unravel in ways that pose threats to the future of human and planetary life (Applebaum, 2020; Hickel, 2020; IPBES, 2019; IPCC, 2018; Kolbert, 2014; Klein, 2014; Levitsky & Ziblatt, 2018; Ripple, et al, 2017; Snyder, 2017; Wallace-Wells, 2019; Weisman, 2013). This multi-faceted "global life emergency" will be the overarchingcontext for human and planetary life for the foreseeable future. Thus, education at all levels should rapidly refocus on teaching about this emergency and how to defuse its threats.

This article briefly explains what the global life emergency is, why it poses an urgent and credible threat to human and planetary life, and why we must teach teachers and students about it. The tone of article's title and some of its text are more direct than is typical because more directlanguage is appropriate duringan emergency.

1. What Is the Global Life Emergency?

In a nutshell, *the global life emergency* is a term that encompasses ten urgent and interrelated threats to human life and planetary life:

1.1 The Ten Threats of the Global Life Emergency

1) Direct destruction of wildlife habitat.
2) Chemical and plastic pollution.
3) Man-made global warming and climate disruption.
4) Technologies untested for long-term safety.
5) Population declines and extinctions of plants and animals.
6) Resource shortages.
7) Wars and terrorism.

[1] , Department of Teacher Education, College of Education and Human Services, Cleveland State University, 2121 Euclid Avenue, Cleveland, OH 44115 k.wheatley@csuohio.edu

8) Vast inequality and the resulting social and political dysfunctions.
9) The global deterioration of democracy.
10) Destructive actions by "too-big-to-stop" nations, corporations, and institutions.

1.1.1 Direct destruction of wildlife habitat. Wildlife is beautiful, amazing, and worthy of protection in its own right. Beyond its intrinsic value, our economy, health, and lives depend on the health of Earth's ecosystems.However, human activity has destroyed roughly half the biomass that once existed on Earth (Schramski, Gattie, & Brown, 2015), including roughly half of Earth's former forests (Crowther, et al. 2015).Humanity has also destroyed fifty percent of the world'swetlands since 1900 (TEEB, 2009), and 80-90% of the Earth's former grasslands (e.g., see Ceballos et al., 2010). Meanwhile, due primarily to global warming and ocean acidification, and even before recent mass bleaching events, scientists were projecting that 90-100% of the world's coral reefs would die in the next few decades (Burke, Reytar, Spalding, &Perry, 2011). Critically, as the size of ecosystems shrinks, they lose their ability to support specific species, and thatsets in motion a trophic cascade in which the biodiversity and the populationsof species in that ecosystem steadily decline or collapse altogether (Kolbert, 2014). Ominously, human activity is shrinking and destroying the ecosystems that all life on Earth depends on.

1.1.2 Chemical and plastic pollution. Humans have created over 100,000 man-made chemicals and plastic compounds, most of which were never tested for long-term safety (see Robin, 2015). Due to human activity, toxic chemicals and microplastics are found everywhere on Earth, from the top of the highest mountains to the bottom of the deepest ocean trenches, and even in our foods, drinks, and bodies (e.g., Law & Thompson, 2014). Even newborns are affected: A study of ten newborns found an average of 200 industrial chemicals and pollutants in their bodies (Environmental Working Group, 2005). Among the chemicals and microplastics in our environment, foods, and bodies are those that are obsesogenic, diabesogenic, atherogenic, mutagenic, carcinogenic, neurotoxins, and endocrine disruptors (e.g., see Bergman, Heindel, Kasten, et al., 2013; Hernandez, Boada, Mendoza, et al., 2015; Kalbrenner, Schmidt, & Penlesky, 2014; Robin, 2014). Thus, growing use of these man-made chemicals and plastics is increasing the rates of disease and premature death for both humans and planetary life.

1.1.3 Man-made global warming and climate disruption. Burning fossil fuels and deforestation have increased atmospheric levels of carbon dioxide (CO2) by roughly 50% in the last 250 years (www.CO2levels.org). A compelling chain of evidence proves that human-induced increases in greenhouse gas levels caused almost all net global warming over the last 140 years, which is an increase in average global temperatures of 1.1 degrees Celsius or 1.9 degrees Fahrenheit (IPCC, 2018; Kramer, He, Soden, et al., 2021). This rate of warming may be imperceptible to humans, but it means we are warming the Earth 10-20 times faster than it warms when coming out of an ice age (Gaffney & Steffen, 2017). Although species and ecosystems can and have adapted to warmer temperatures and higher CO2 levels in the past, it is this rapid rate of warming and the disruption of weather patterns that is so harmful to the health of ecosystems and that can set mass extinctions in motion. Thus, human activity is steadily disrupting the delicate climate balance that all life on Earth is adapted to.

1.1.4 Technologies untested for long-term safety. On a great many occasions in human history, the inventor or producer of some new invention reassuredthe public, "Don't worry, it's perfectly safe," but then we learned too late that this new invention caused significant harm to either human or planetary life. Past examples of profitable but life-threatening technologies include tobacco, chemical weapons, leaded gasoline, nuclear weapons, and burning fossil fuels. Humanity is now racing ahead with the adoption or employment of a variety of technologies that were never tested for long-term safety and about which leading scientists have warned us, including fracking (Gillespie, Davis, Stephens, et al., 2019);pesticides and herbicides (Robin, 2014);artificial intelligence,synthetic biology, and geoengineering(Beckstead, Bostrom, Bowerman, et al., 2014);social media algorithms;5G (Moskowitz, 2019);and nanotechnologies. Thus, humanity is putting the future of life on Earth in jeopardy by using untested technologies that could have catastrophic effects for human and planetary life.

1.1.5 Population declines and extinctions of plants and animals. Due in part to the effects of the four threats above but also due to hunting, fishing, and poaching, the populations of most types of wildlife are declining precipitously. Forty percent of the world's 11,000 bird species are in decline and about 12% are already threatened with global extinction(BirdLife International, 2018).

The rates of amphibian extinctions are now thousands of times higher than the expected rate (Kolbert, 2014), and the average decline in vertebrate species has been 50% since 1970 (World WildLife Fund, 2014). Based on a 2020 assessment, more than one million plant and animal species are now threatened with extinction in coming decades (IPBES, 2019).Onetelling indicator of how humanity's footprintis crowding out other species is that our livestock now outweigh terrestrial mammals by a factor of fifteen to one (Ritchie & Roser, 2020).

To reiterate, population declines and extinctions tend to snowball and create even more extinctions and further breakdown of ecosystems.

1.1.6 Resource shortages. Because human civilization depends on over 100 precious resources, and because we have been using up many of these resources at an accelerating rate, we face increasing shortages of precious natural resources (Clugston, 2012). The easy-to-reach resources have largely been depleted, so humans have resorted to more intrusive and destructive extraction methods (mountaintop removal, fracking, drilling in the Arctic, open-pit strip mining). Given its critical importance for all life, growing shortages of fresh drinking waterrepresent one of the most urgent resourceshortages. One studyfound that 21 of the 37 major aquifers on Earth were being depleted faster than nature could replenish them, and 15 of those 21 were moderately to extremely stressed (Richey, Thomas, Lo, et al., 2015).

1.1.7 Wars and terrorism. Deaths from wars have declined in recent decades, but worsening resource shortages, climate disruption, environmental catastrophes, and the resulting waves of refugeesthreaten to ramp up wars and terrorism in the future. It is no accident that many of the wars in recent decades have taken place in oil-rich countries. Global tensions may also be exacerbated because past environmental destruction was primarily caused by wealthy people and wealthy nations in the global north but the harms have disproportionately fallen on poorer people, poorer nations, and the global south (Hickel, 2020; Wackernagel & Beyers, 2019). Obviously, the effects of wars on both humans and ecosystemsare disastrous.

1.1.8 Vast inequality and the resulting social and political dysfunctions. A large body of research has implicated vast economic inequality as a causal factor in promoting a wide array of social dysfunctions (Wilkinson & Pickett, 2010) as well as political corruption and dysfunction (e.g., Hacker & Pierson, 2010). Vast inequality also means that anenormous proportion of wealth and power is held by individuals or corporations who are often hostile to the goals of caring well for people and the Earth. At the same time, because of mechanisms such as "expenditure cascades," vast inequality makes it more difficult for average families to make ends meet (Frank, 2013), which increases social tensions and the fraying of the social fabric (Wilkinson& Pickett, 2010). People are healthier and countries are more functional when they are more equal (Wilkinson & Pickett, 2010), butin these ways, vast inequality prevents society from having the capacity to solve its social or environmental problems.

1.1.9 The global breakdown of democracy. There is worrying evidence that the degree ofdemocracy in the world has been in decline for 14 straight years (Freedom House, 2020). The United States—which once prided itself as the model for democracies elsewhere—has steadily become less free, declining 8 points on Freedom House's 100-point scale over the last decade, and now ranks near the bottom of OECD nations in the degree of democracy (60 nations rank ahead of the U.S.). Meanwhile, the economically-rooted social and political tensions described above have fomented unrest, racial tensions, religious intolerance, white nationalism, and xenophobia in countries such as Poland, France, Turkey, the U.S., and elsewhere. This fraying of the social fabric has created fertile ground for the rise of political extremism and authoritarianism, both of which undermine or displace democracy (e.g., Applebaum, 2020, Levitsky & Ziblatt, 2018). Many analysts point out that the elites within these countries have often neglected the needs of average citizens while catering to the wealthy and powerful (Giradharadas, 2018; Hacker & Pierson, 2010). Such self-dealing has eroded faith in democratic governance,while the decline in democracy undermines the ability of the most powerful institutions on Earth to deal effectively with the existential threats we face.

1.1.10 Destructive actions by "too-big-to-stop" nations, corporations, and institutions. For most of human history, no individual person or nation-state had the power to wipe out most of life on Earth. Nuclear weapons changed that. However, we now have created multiple methods by which we can destroy and are destroying the web of life life—habitat destruction, chemical and plastic pollution, global warming and climate disruption, direct killing of species, massive freshwater withdrawals, wars, and technologies untested for long-term safety. The ominous thing about our current predicament is that all that the people in wealthy nations would need to do in order to collapse Earth's ecosystems is to keep living each day as we are currently living it; waking up each day and doing what we usually do, eating what we usually eat, getting to places the way we usually do, and so on.

That is, our entire industrialized capitalist economy and consumerist lifestyles are harmful to and totally out-of-balance with the long-term needs of life on Earth. Significantly, thisunhealthy form of civilization was aggressively promoted by the same nations, corporations, and international institutions that are still encouraging us to continue down this destructive path. Critically, the policies that will be needed to care well for humanity and Earth's ecosystems are roughly the opposite of what serves the short-term financial interests of wealthy individuals and corporations. Thus, whether these "too-big-to-stop" entities are corporations (Exxon, Amazon), international institutions (World Trade Organization, International Monetary Fund), or nation states (China, The

United States), the existence of unchecked power focused on short-term economic or political gains poses an existential threat to all life on Earth.

2. The Global Life Emergency Threatens to Collapse Ecosystems and Human Civilization

Even if we solved global warming tomorrow, any of the other nine threats that make up the global life emergency could set in motion chain reactions that could badly degrade or collapse Earth ecosystems, society, or both. Because *humans are totally dependent on the health of ecosystems,* if Earth's ecosystems collapse, our food supply, society, and population would collapse too. At the same time, humanity has become the main factor re-shaping and destroying life ecosystems. Thus, if our society became more dysfunctional or simply remainedrather dysfunctional, that dysfunction may make us unable to make the massive changes that are needed to help ecosystems avoid collapse and begin to heal.

Humans often assume that things will go on as they always have, so the idea that society or ecosystems could collapse often seems unimaginable to us. However, great civilizations *have*collapsed in the past, and human activity has already created ecosystem collapse in many areas, such as dying coral reefs, the 400+ dead zones human activity created in the world's waterways (Diaz, 2008), and the physical collapse of Arctic permafrost. Given our short attention spans and lifespans, the year-to-year or decade-to-decade changes may seem insignificant to us, but humans are changing the face of the Earth at a terrifying speed and have already set in motion the sixth mass extinction of life on Earth (IPBES, 2019; Kolbert, 2014). On the social side of the ledger, and despite welcome gains such as the greater education of girls globally, the vast increases in global inequality, retreat of democracy, fraying of the social fabric (e.g., Anderson, 2017), and rise of intolerant and authoritarian leaders in many "civilized" societies suggests that our civilization is more brittle than many would like to think. Just this year, an armed insurrection attempted to stop the peaceful transfer of power in the world's oldest democracy—urged on by that nation's president. Thus, serious academics in the natural sciences are increasingly warning about the likelihood of serious ecosystem collapse and how to avoid it (e.g., Hickel, 2020),and serious academics in the social sciences are increasingly warning about how we can keep our societies from unraveling or democracies from dying (e.g., Levitsky & Ziblatt, 2018).

History reveals that there are two common causes of most collapses of great civilizations in the past (e.g., Diamond, 2011).First, those societies exhausted the available natural resources needed for their operation and/or degraded local ecosystems to the point of collapse. Second, a small group of self-interested elites started tilting public policy towards their own enrichment rather than the needs of average citizens and local ecosystems. Unfortunately, both conditions are very much in evidence in modern civilization. However, whereas past civilizations collapsed *local* ecosystems that could then regenerate with help from untouched wilderness nearby, we are in the process of degrading and possibly collapsing *all ecosystems* on Earth simultaneously.

What many people don't grasp about these crises is that although the Earth has changed many times in the past, it is the speed of the changes we have set in motion that is especially lethal to life. Life is adaptable, but there are limits to how much or how fast it can adapt. Thus, the last time the Earth warmed this rapidly and oceans became more acidic this rapidly was just prior to the Permian-Triassic mass extinction, when over 95% of marine life went extinct as did over 70% of life on land (Penn, Deutsch, Payne, & Sperling, 2018). Making our current predicament even scarier, that catastrophic mass extinction occurred without the direct habitat destruction, chemical and plastic pollution, or technologies untested for safety that humans have added on top of rapid global warming and ocean acidification.

2.1 Grasping the Scale of The Global Life Emergency

To understand the scale of this global life emergency, it helps to understand that those ten factors also set in motion feedback loops and ripple effects, some of which are disastrous in their own right. The below only begins to detail those secondary threats.

2.1.1 Destructive ripple effects. One set of cascading ripple effects involves the way that global warming and ocean acidification from our greenhouse gas emissions are killing the world's coral reefs. Those reefs support 25% or more of marine life in the oceans that help provide food for billions of people. Next, because the atmosphere can hold roughly 7% more moisture when it is 1 degree warmer, warming creates more intense droughts and wildfires in some places (Cook, 2018; Jones, Smith, Betts, et al., 2020),while creating more intense storms, hurricanes, and flooding in other places (Blöschl, Hall, Viglione, et al., 2019; Kossen, Knapp, Olander, & Velden, 2020). Due to man-made global warming, portions of the United States and Europe are now suffering from the worst mega-drought in over 1000 years (Büntgen, Urban, Krusic, et al., 2021; Stahle, 2020), while the U.S., Australia, and Siberia have also suffered from record-breaking wildfires. Global warming and the related

droughts and increases in invasive species (e.g., bark beetles)have killed hundreds of millions if not billions of trees in the United States and Canada.

For example, half the trees in the southern Sierra Nevada mountains have been killed by drought (Fettig, Mortenson, Bulaon, & Foulk, 2018). In many places, due to the warmer and dryer conditions from global warming, forests are not re-growing after droughts or wildfires, but rather, shrubland is growing in their place (Stevens-Rumann, Higuera, Harvey, et al. 2018).

At the same time, by 2070, global warming is on pace to leave 2-3.5 billion people living in places that will sometimes be unbearablyhot without air conditioning (Xu, Kohler, Lenton, et al. 2020).Making matters worse, warming has accelerated the melting of global ice (Slater, Lawrence, Otosaka, et al., 2021), and the added meltwater plus thermal expansion could create somewhere between 1 and 4 feet of sea level rise by 2100 (Horton, Khan, Cahill, et al., 2020). Rising seas will create staggering expenditures worldwide; to mitigate the costs of floods, fortify cities against the sea, and relocate populations and citiesto higher ground. Unbearable heat, drought, wildfires, crop failures, flooding, or wars over scarce resources are likely to create waves of refugees, with as many as 2 billion people displaced by 2100 (Geisler & Curren, 2017). Given that rising inequality has exacerbated political dysfunction and the fraying of the social fabric, this means that refugees will be increasing in number at precisely the time that many nations are not just becoming less welcoming, they are becoming increasingly hostile to ethnic minorities, religious minorities, and immigrants.Thus, if we stay on our current trajectory, we can predict a snowballing of environmental disasters and social dysfunctions at precisely the time at which the capacity of societies and governments to deal with them will be declining.

2.1.2 Humanity's footprint helps us grasp the scale of the life emergency. Examining the mismatch between Earth's biocapacity and the size of humanity's ecological footprint is another path to understanding the true scale of the life emergency. Just as a family's annual income limits what they can spend each year without drawing down their reserves and causing financial collapse, Earth's annual capacity to provide natural resources and absorb our wastes in a sustainable way limits how humans can live without causing ecosystem collapse. This capacity to produce natural resources and absorb our wastes depends on the amount of biologically-fertile land available and how much biomass occupies it, and in 2016, that amounted to 12.2 billion hectares of land. With a little under 7.8 billion people on Earth, that makes each person's fair-share portion of Earth's biocapacity just 1.63 hectares (4 acres) per year, but unfortunately, humanity's ecological footprint currently averages 2.73 hectares per person (Global Footprint Network, 2021). Whenever humanity's annual footprint exceeds Earth's biocapacity at that point in time, we draw down Earth's remaining biocapacity, thus reducing Earth's capacity to provide for us in the future while pushing ecosystems closer to collapse.

Humanity's overshoot of Earth's annual carrying capacity is due to the resource-intensive economies and lifestyles of wealthier nations, with just the richest 10% of people on Earth responsible for 48% of our annual carbon footprint (United Nations Environment Programme, 2020). To illustrate the scale of the overshoot for wealthy nations, the total environmental footprint for the average American is currently 8.22 hectares (20.3 acres) per person, more than five times Earth's carrying capacity. This is why, if everyone on Earth lived like the average American, we would need to have more than five Earths to provide all the needed resources and absorb all the wastes produced. But of course, we only have one Earth, and humans must learn to live within its limits.

2.1.3 The scale of the solutions illuminates the scale of the emergency. To fully grasp the scale of the life emergency, it also helps to understand what is needed fix it. While a full explication of solutions is beyond the scope of this article, here is an overview of the path to avoiding collapse, and some examples of the daunting scale of the needed solutions.

To keep ecosystems from degrading further and then collapsing, we must achieve *net annual healing* of ecosystems; for ecosystems to get steadily healthier rather than sicker. Next, achieving net annual healing will require us to *reverse* humankind's main impacts on nature, and do so on multiple fronts simultaneously. To protect biodiversity, prevent ecosystem collapse, and sequester billions of tons of carbon, we must not just slow habitat loss but *increase* the size of forests and other wilderness areas. To protect biodiversity and prevent ecosystem collapse,we also must *reduce* the levels of man-made chemicals and plastics in the environment, get net annual carbon emissions down to *net negative emissions*, *reduce* direct killing of fish and wildlife, and *ban or replace*many technologies that were never tested for long term safety.

From an environmental impact standpoint, this is as if we must run the film of the last century in reverse. Humanity's environmental footprint is now roughly 175% of Earth's annual carrying capacity (Global Footprint Network, 2021), so healing the web of life will require that we rapidly shrink humanity's total footprint by about 50%. Because the vast majority of energy use, resource use, greenhouse gas emissions, and ecosystem destruction

was and still is caused by the world's wealthiest people and nations, the only way to achieve that is for the wealthiest 20% of the world's population to shrink their footprints by a stunning 70-90+%.

Some of the very wealthiest individuals and families will have to shrink their consumption and impacts by 99+% in order to bring their footprints within their fair share of Earth's annual biocapacity. And that means shrinking multiple aspects of their footprints by over 99%; their pollution footprint, carbon footprint, land-use footprint, and theirresource-use footprint.

The scale of the environmental side of the life emergency really comes into focus if we ask what would it take to reduce the footprint of the average American so that it falls within their fair share of Earth's annual carrying capacity. Let's imagine that America already had 100% renewable energy, had a circular economy that slashes pollution to 10% of former rates, had electric cars and buses but people increasingly used mass transit, had walkable cities and passive homes that cut energy use 85%, slashed air travel, had more localized economies, eliminated plastics, and had eco-friendly clothing and household items. Would that be enough to shrink Americans' footprints down to their fair share of Earth's resources? Not even close. Just the diet of the average Americanvastly exceeds Earth's annual carrying capacity. That is, if everyone on Earth merely ate like the average American, we would have to use every square meter of habitable land on Earth just to grow food—plus we would somehow need to create 30-38% more habitable land—just to support that land-intensive diet (Ritchie, 2017). Obviously,this is impossible, but even attempting it would make Earth's remaining ecosystems collapse long before we created all that farmland. Put differently, we would need roughly three Earths just for everyone to eat as the average American does. To bring the diets all my fellow Americans down a sustainable level while allowing for each citizen's other per-year land-use impacts, Americans would need to eliminate the excess calories in their diets, reduce protein consumption by 13%, and then reduce meat consumption by roughly 80% (Peters, Picardy, Darrouzet-Nardi, et al., 2016). Reducing meat consumption is critical because growing livestock—especially cattle, sheep, and goats—uses an enormous amount of land, making omnivorous diets use 4-8 as much land as isocaloric vegan or vegetarian diets use (Peters, Picardy, Darrouzet-Nardi, et al., 2016).

As this example illustrates, solving just the environmental side of the global life emergency would require a fundamental transformation of the economies and lifestyles of wealthy industrialized nations. And as scientists keep warning us, we need this profound transformation of our civilization to get well underway in this decade.

2.2 The Benefits and Limitations of Technology for Solving the Life Emergency

Many people believe new technologies will solve our environmental crises, but the mining/logging, transport of raw materials, manufacture, use, and disposal of almostevery man-made object caused net harm to the web of life.What this means is that windmills and solar panels are not really "green" energy, they are just less harmful in terms of carbon emissions than burning fossil fuels is. Because virtually all man-made objects harm the web of life, even as our technologies became more sophisticated, the rate at which we destroyed Earth's ecosystems actually *accelerated*. Thus, healing ecosystems will require not just "greener" man-made objects but fewer man-made objects and simpler lives (e.g., see Merkel, 2003).

Because they are so fixated on the climate crisis, many people have lost sight of the fact that healing ecosystems and protecting the future will require us to solve the crises of habitat loss, pollution, climate disruption, untested technologies, biodiversity, and resource shortages *simultaneously*. For example, although solar panels and windmills help us solve the climate crisis, unless they can be made in greener ways, mass manufacture and disposal of solar panels and windmills could have the tragically ironic effect of destroying Earth's ecosystems via pollution, habitat destruction, and loss of biodiversity. Similarly, electric cars are less harmful in terms of greenhouse gases than are internal combustion automobiles, but even electric cars still add to global warming and their batteries posesenormous problemsfor habitat destruction and chemical pollution. Furthermore, while switching to lab-grown meats would reduce the land-use footprint of our diets, it might produce intolerable levels of biological wastes. In short, the scale of the emergency is so enormous that healing life on Earth will require more than clever technologies, but rather, a rapid and far-reaching transformation of every sector of our society.

3. Why We Must Teach Teachers and Students About the Global Life Emergency

On the one hand, it should be self-evident why we must make teaching students and their teachers about the global life emergency a top priority. On the other hand, people and institutions have a great deal of inertia and are notorious for resisting change. Thus, it may be necessary to state the obvious: Unless we teach teachers and students about the Earth Emergency and what is needed to defuse its threats, we will educate a generation of people who are wholly unequipped for the central challenges of the 21st century. To put a finer point on that, we must teach people about the Earth Emergency and its solutions or face a major collapse of ecosystems, human civilization, and the human population. Again, this is not hyperbole: the sixth mass extinction of life on Earth is

already underway (Kolbert, 2014; Schramski, Gattie, & Brown, 2015) and the fraying of the economic, political, and social fabric is abundantly evident on every settled continent (Anderson, 2017; Applebaum, 2020).

4. Answering Common Objections to Teaching About the Life Emergency

There are many objections that people raise regarding teaching about the Life Emergency in schools; some will claim we do not face a crisiswhile otherswill acknowledge problems exist but say it is inappropriate or unnecessary for teachers to teach about them. Answering all those objections in depth would fill a few books, but let me briefly address some of the most common and important objections.

4.1 Claims That We Don't Face a Life Emergency

4.1.1 "Humans can't hurt the Earth."Having discussed these issues with hundreds of people, a surprising number of people still believe human activity can't harm ecosystems. When faced with this objection, one can simply point out some of the many ways human activity has already harmed the web of life, from helping kill off the megafauna to chopping down half the world's forests, filling in wetlands, driving many species to extinctions, polluting the whole face of the Earth, and turning vast swaths of wilderness into cities, suburbs, and shopping malls.

4.1.2"Humans aren't warming the Earth. It's a hoax."There is a great deal of very persuasive misinformation on the Internet that leads many people to believe human activity is not warming the planet. Faced with this objection, an effective response requires knowing the chain of research evidence which demonstrates that human activity caused all net global warming over the last 140 years and that all the major predictions of the theory of man-made global warming have come true. For example, burning fossil fuels increased of carbon dioxide in the lower atmosphere, and after burning vast amounts of fossil fuels, the lower atmosphere warmed. That warming was accounted for by increased levels of thermal energy in the lower atmosphere at the exact wavelengths that greenhouse gases absorb and re-radiate, thus slowing the escape of that heat to the upper atmosphere and outer space (e.g., see all three levels of evidence at Skeptical Science, 2015). For links to evidence-based rebuttals to 198 common global warming and climate disruption myths, see Skeptical Science (2021).

4.1.3 "Climate models have been inaccurate, showing that the theory is wrong." In reality, Hausfather, Drake, Abbott, and Schmidt (2020) found that 14 of the 17 different climate models they analyzed have beenimpressively accurate in predicting how much additional CO2 emissions would create how much additional warming. Ironically, even the model developed by the Exxon corporation's own scientists in the 1980s predicted quite accurately how burning fossil fuels would warm the atmosphere.

4.1.4 "Life did just fine before when the Earth was warmer and CO2 levels were higher."While this is true, it helps to point out to people that humans weren't around then, and all Earth's ecosystems have been adapted to cooler temperatures and lower levels of atmospheric carbon dioxide. In fact, atmospheric CO2 levels had been at 300 parts per million or lower for the last 800,000 years—until we started burning fossil fuels.

4.1.5"More CO2 is a good thing that is creating global greening."This is a half-truth that confuses many people. In the short run, more CO2 has created an increase in foliage on Earth. However, as the full effects of that additional CO2 for creating additional warming are starting to appear, thatshort-term greening trend is starting to be offset by drier, more stressed, and dying ecosystems. As noted earlier, mega-droughts worse than any in over 1000 years are now afflicting both Europe and the American west at the same time. More generally, the long-term ripple effects of more CO2 include ocean acidification, deaths of coral reefs and other marine life, collapsing permafrost, more intense droughts, wildfires, storms, floods, and hurricanes, melting global ice and rising sea levels, the disappearance of forests, disruption of reproduction, and mass extinctions of species.

4.1.6 "The climate scientists fudged the data."Some weather stations used to collect data in the mornings and others in the afternoons, and for that reason and others, of the existing raw climate data has been adjusted to yield better apples-to-apples comparisons. These adjustments made the climate data more trustworthy, not less so, and despite claims of climate frauds, there is no meaningful evidence showing that researchers have fudged data or published intentionally-misleading climate research. In fact, some of those data adjustments reduced the amount of long-term global warming, hardly the outcome that would occur if climate scientists were inflating global warming intentionally.

4.1.7 "Scientists' past predictions of disaster didn't come true: We can't trust them." Isolated scientists or public figuressometimes did make predictions that didn't pan out, such as when a few scientific papers back in the 1970s predicted global cooling or Al Gore exaggerated how soon coastal cities would be swamped by sea level rise. However, Al Gore is not a scientist, and the predictions of the majority of scientists have either been quite accurate or conditions are actually getting worse faster than scientists had predicted.

For example, most scientific papers in the 1970s predicted global warming due to burning fossil fuels, and global ice melt and sea level rise are both happening faster than the majority of experts once predicted.

4.1.8 "Who cares if some species die off? We'll be fine." Many people in western civilization have lost sight of the fact that humans are part of nature and our fate is intertwined with the fates of other species. Thus, aside from the intrinsic value of other species, it helps to educate people about the ways that humanity depends on the health of Earth's ecosystems. The more species die, the less resilient ecosystems become and more prone they are to major degradation or collapse. If ecosystems collapse, our food supply collapses along with them.

4.1.9"This is all just an excuse for raising taxes or instituting socialism." This objection shifts the discussion away from whether or not there are real crises. Thus, it is helpful to keep the discussion focused on the evidence of multiple existential threats.

4.1.10 Society is getter stronger and making progress. Some authors (e.g., Rosling, 2020) and public figures such as Bill Gates make the argument that human civilization has made tremendous progress recently and that this is the best time in history to be alive. While humanity has made progress on multiple fronts, it is also clear that some of the main structural issues that will determine humanity's fate are either in a poor state (inequality) or are getting worse (health of ecosystems, degree of democracy). Finally, all by itself, the degradation of ecosystems threatens to collapse our civilization, thus overshadowing humanity's recent social or technological accomplishments.

4.2 Countering Arguments That We Shouldn't Teach About the Global Life Emergency

4.2.1 "Schoolchildren don't need to know about this because technology will save us." Many people believe this, and some technologies will be helpful in helping resolve the life emergency. However, as that diet footprint example shows, resolving these crises is going to take a profoundtransformation of our lives and society. That makes resolving the life emergencymore a problem of mindset and morality than a technological problem. That is, we already have all the solutions we need, so the real question is whether we have the mindset and moral character needed to choose the paths that lead towards healing.

4.2.2 "It is too scary. Children aren't ready for this."Educators teach young children what to do in case of a tornado in places where tornados never hit and to "stop, drop, and roll" if their clothing ever catches fire—although children's clothing almost never catches on fire. Surely we should also teach students about the ecological and societal crises that will actually define the future for everyone. We also teach school-age children about stranger danger, drug abuse, sex, and what to do if they find a gun: Surely they are also capable of learning about this life emergency and what we need to do to resolve it. In fact, most students at most ages are already aware of many aspects of this global life emergency. If we don't teach about it, they will be fearful about these crises while lacking the necessary knowledge and skills to solve them.

4.2.3 "They can learn about it in college or on the Internet."First, the transformed ways of thinking and living that are needed to help heal society and the planet need to be developed from an early age, and if we are not teaching schoolchildren those, then we are implicitly saying it is fine for them to keep living in the ways that created this emergency in the first place. Second, as scientists keep frantically pointing out to us, we need to be making transformational changes in our civilization in this decade or the disasters will only get worse.

4.2.4. "We don't have time to focus on this. We have to teach 'the basics'." Nothing is more basic or important than learning that the web of life is unraveling and learning what we all must do to heal it. With all due respect to traditional school subjects, everything else is trivial by comparison. Furthermore, reading, writing, mathematics, and all the rest are best learned and retained when they are learned in the context of studying something with real-world significance, such as human survival and thriving. Fortunately, the kind of education that will work best for preparing students to help resolve the global life emergency is also what works best for promoting democracy and healthy, whole-child development.

5. Conclusion

The health of societies and the ecosystems all human and planetary life depend on are unraveling in interconnected ways. This global life emergency will be the main context for all life on Earth for the foreseeable future. Thus, educators at all levels need to make teaching about this emergency and its solutions the central focifor education. My institution (insert University Name), has begun reorganizing its P-5 teacher education programs to prepare teachers to teach their pupils how to help heal society and the Earth. We hope many other educators and teacher educators will join us very soonin teaching about the global life emergency.

References

Anderson, C. (2017). *White rage: The unspoken truth of our racial divide.* Bloomsbury.

Applebaum, A. (2020). *Twilight of democracy: The seductive lure of authoritarianism.* Doubleday.

Beckstead, N., Bostrom, N., Bowerman, N., Cotton-Barratt, O., MacAskill, W., hEigeartaigh, S. O., & Ord, T. (2014). *Unprecedented technological risks.* Global Priorities Project, Future of Humanity Institute, Oxford Martin School, University of Oxford, Centre for the Study of Existential Risk: University of Cambridge.

Bergman, A., Heindel, J. J., Kasten, T., et al. (2013). The impact of endocrine disruption: A consensus statement on the state of the science. *Environmental Health Perspectives, 121*(4), A104-106.

BirdLife International (2018). *State of the world's birds: Taking the pulse of the planet.* BirdLife International.

Blöschl, G., Hall, J., Viglione, A. et al. (2019). Changing climate both increases and decreases European river floods. *Nature, 573,* 108–111.
doi.org/10.1038/s41586-019-1495-6

Büntgen, U., Urban, O., Krusic, P.J. et al. (2021). Recent European drought extremes beyond Common Era background variability. *Nature Geoscience.* doi.org/10.1038/s41561-021-00698-0

Burke, L., Reytar, K., Spalding, M., & Perry, A. (2011). *Reefs at risk revisited.* World Resources Institute.

Ceballos, G., Davidson, A., List, R., Pacheco, J., Manzano-Fischer, P., Santos-Barrera, G., Cruzado, J. (2010). Rapid decline of a grassland system and its ecological and conservation implications. *PLoS ONE 5*(1): e8562. https://doi.org/10.1371/journal.pone.0008562

Cook, B. I., et al. (2018) Climate change and drought: From past to future. *Current Climate Change Reports.* doi:10.1007/s40641-018-0093-2

Clugston, C. O. (2012) *Scarcity: Humanity's final chapter?* Booklocker.

Crowther, T., Glick, H., Covey, K. et al. (2015). Mapping tree density at a global scale. *Nature, 525,* 201–205. doi.org/10.1038/nature14967

Diamond, J. (2011). *Collapse: How societies choose to fail or succeed* (Rev. Edition). Penguin.

Diaz, R. J., & Rosenberg, R. (2008). Spreading dead zones and consequences for marine ecosystems. *Science, 321*(5891), 926–929. doi: 10.1126/science.1156401

Environmental Working Group (2005). *Body burden: The pollution in newborns.* Environmental Working Group.

Fettig, C. J., Mortenson, L. A., Bulaon, B. M., Foulks, P. B. (2019). Tree mortality following drought in the central and southern Sierra Nevada, California, U.S.. *Forest Ecology and Management, 432*(15), 164-178.

Frank, R. H. (2013). *Falling behind: How rising inequality harms the middle class.* University of California Press.

Freedom House. (2021). *Countries and territories.* Retrieved 3/15/21 from https://freedomhouse.org/countries/freedom-world/scores

Gaffney, O., & Steffen, W. (2017). The anthropocene equation. *The Anthropocene Review, 4*(1), 53-61.

Gillespie, J. M., Davis, T. A., Stephens, M. J., Ball, L. B., & Landon, M. K. (2019). Groundwater salinity and the effects of produced water disposal in the Lost Hills-Belridge oil fields, Kern County, California. *Environmental Geosciences, 26*(3) 73-96. doi: 10.1306/eg.02271918009

Geisler, C., & Curren, B. (2017). Impediments to inland resettlement under conditions of accelerated sea level rise. *Land Use Policy, 66*, 322-330.

Giradharadas, A. (2018). *Winners take all: The elite charade of changing the world.* Vintage.

Global Footprint Network. (2021).https://www.footprintnetwork.org/

Hacker, J. S., & Pierson, P. (2010). *Winner-take-all politics: How Washington made the rich richer and turned its back on the middle class.* Simon & Schuster.

Hausfather, H., Drake, H. F., Abbott, T., & Schmidt, G. A. (2020). Evaluating the performance of past climate model projections. *Geophysical Research Letters, 47*(1). doi.org/10.1029/2019GLO5378

Hickel, J. (2020). *Less is more: How degrowth will save the world.* Cornerstone Digital.

Hernandez, A. R., Boada, L. D., Mendoza, Z., et al. (2017). Consumption of organic meat does not diminish the carcinogenic potential associated with the intake of persistent organic pollutants (POPs). *Environmental Science Pollution Research International, 24*(5), 4261-4273.

Horton, B.P., Khan, N.S., Cahill, N., et al. (2020). Estimating global mean sea-level rise and its uncertainties by 2100 and 2300 from an expert survey. *npj Climate and Atmospheric Science,* 3(18).doi.org/10.1038/s41612-020-0121-5

IPBES (2019): *Global Assessment Report on Biodiversity and Ecosystem Services of the Inter-governmental Science-Policy Platform on Biodiversity and Ecosystem Services.* E. S. Brondizio, J. Settele, S. Díaz, & H. T. Ngo (eds). IPBES secretariat.

IPCC (2018). *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)].

Kalbrenner, A. E., Schmidt, R. J., Penlesky, A. C. (2014). Environmental chemical exposures and autism spectrum disorders: A review of the epidemiological evidence. *Current Problems in Pediatric Adolescent Health Care, 44*(10), 277-318.

Jones, M. W., Smith, A., Betts, R., Canadell, J. G., Prentice, I. C., & Le Quere, C. (2020). *Climate change increases the risk of wildfires*. ScienceBrief. Retrieved 3/25/21 from

https://tyndall.ac.uk/sites/default/files/wildfires_briefing_note.pdf

Klein, N. (2014). *This changes everything: Capitalism vs. the climate.* Simon & Schuster.

Kolbert, E. (2014). *The sixth extinction: An unnatural history.* Henry Holt and Co.

Kossin, J. P., Knapp, K. R., Olander, T. L., & Velden, C. S. (2020). Global increase in major tropical cyclone exceedance probability over the past four decades. *PNAS, 117*(22), 11975-11980. doi.org/10.1073/pnas.1920849117

Law, K. L., & Thompson, R. C. (2014). Microplastics in the sea. Science, 345(6193), 144-145.

Kramer, R. J., He, H., Soden, B. J., Oreopolous, L., Myrhe, G., Forster, P. M., & Smith, C. J. (2021). Observational evidence of increasing radiative forcing. Geophysical Research Letters.doi.org/10.1029/2020GLO91585

Levitsky, S., & Ziblatt, D. (2018). *How democracies die.* Crown.

Merkel, J. (2003). *Radical simplicity: Small footprints for a finite Earth.* New Society Publishers, 2003.

Moskowitz, J. M. (2019). We have no reason to believe 5G is safe. *Scientific American*. Retrieved 3/19/31 from https://blogs.scientificamerican.com/observations/we-have-no-reason-to-believe-5g-is-safe/

Penn, J. L., Deutsch, C., Payne, J. L., & Sperling, E. A. (2018). Temperature-dependent hypoxia explains biogeography and severity of end-Permian marine mass extinction. *Science, 362*(6419). doi: 10.1126/science.aat1327

Peters, C. J., Picardy, J., Darrouzet-Nardi, A. F., Wilkins, J. L., Griffin, T. S., &Fick, G. W. (2016). Carrying capacity of U.S. agricultural lands: Ten diet scenarios. *Elementa: Science of the Anthropocene* (2016) 4: 000116.doi.org/10.12952/journal.elementa.000116

Ritchie, H. (2017). *Land requirements by national diet.*Retrieved 3/7/21 from https://ourworldindata.org/agricultural-land-by-global-diets

Ritchie, H., & Roser, M (2020). *Environmental impacts of food production.* Retrieved 3/29/21 from https://ourworldindata.org/environmental-impacts-of-food

Richey, A. S., Thomas, B. F., Lo, M.-H., Reager, J. T., Famiglietti, J. S., Voss, K., Swenson, S. & Rodell, M. (2015). Quantifying renewable groundwater stress with GRACE. *Water Resources Research, 51*, 5217–5238. doi:10.1002/ 2015WR017349.

Ripple, W. J., Wolf, C., Newsome, T. M., et al. (2017). World scientists' warning to humanity: A second notice. *BioScience, 67*(12), 1026-1028. doi.org/10.1093/biosci/bix125

Rosling, H. (2020). *Factfulness: Ten reasons we are wrong about the world—and why things are better than you think.* Flatiron Books.

Schramski, J. R., Gattie, D. K.,& Brown, J. H. (2015). Human domination of the biosphere: Rapid discharge of the earth-space battery foretells the future of mankind. *PNAS, 112*(31), 9511-9517. doi.org/10.1073/pnas.1508353112

Skeptical Science (2015). *How do we know more CO2 is causing warming?* Retrieved 3/30/21 from https://skepticalscience.com/empirical-evidence-for-co2-enhanced-greenhouse-effect-basic.htm

Skeptical Science (2021). Global warming & climate change myths. Retrieved 3/30/21 from https://skepticalscience.com/argument.php

Slater, T., Lawrence, I. R., Otosaka, I. N., Shepherd, A., Gourmelen, N., Jakob, L., Tepes, P., Gilbert, L., & Nienow, P. (2021). Earth's ice imbalance. *The Cryosphere, 15,* 233–246. doi.org/10.5194/tc-15-233-2021, 2021

Stevens-Rumann, C. S., Higuera, K. B., Harvey, B. J., et al. (2018). Evidence for declining forest resilience to wildfires under climate change.*Ecology Letters, 21*, 243–252.

Robin, M.-M. (2014). *Our daily poison: From pesticides to packaging, how chemicals have contaminated the food chain and are making use sick.* The New Press.

Snyder, T. (2017). *On tyranny. Twenty lessons from the twentieth century.* Random House.

Stahle, D. W. (2020). Anthropogenic megadrought. *Science, 368*(6488), 238-239. doi: 10.1126/science.abb6902

TEEB (2009). *The Economics of Ecosystems and Biodiversity: TEEB for National and International Policy Makers*. TEEB.

United Nations Environment Programme. (2020). *Emissions Gap Report 2020*. United Nations Environment Programme.

Wackernagel, M., & Beyers, B. (2019). *Ecological footprint: Managing our biocapacity budget*. New Society Publishers.

Wallace-Wells, D. (2019). *The uninhabitable Earth: Life after warming*. Tim Duggan Books.

Weisman, A. (2013). *Countdown: Our last, best hope for a future on Earth?* Back Bay Books.

Wilkinson, R., & Pickett, K. (2010). *The spirit level: Why greater equality makes societies stronger*. Bloomsbury Press.

World Wildlife Fund (2014). *Living Planet Report 2014*. World Wildlife Fund.

www.CO2levels.org (2021).*Real-time and historical CO2 levels*. CO2levels.org.

Xu, C., Kohler, T. A., Lenton, T., Svenning, J.-C., & Scheffer, M. (2020). Future of the human climate niche. *PNAS, 117*(21), 11350-11355. doi.org/10.1073/10.1073/pnas.1910114117