**The doomers are wrong about humanity’s future — and its past**

The necessity of progress.

*Part of*[***Against Doomerism***](https://www.vox.com/the-highlight/23632673/against-doomerism)*from*[***The Highlight***](https://www.vox.com/the-highlight?itm_campaign=hloct22&itm_medium=article&itm_source=intro)*, Vox’s home for ambitious stories that explain our world.*

If I wanted to convince you of the reality of human progress, of the fact that we as a species have advanced materially, morally, and politically over our time on this planet, I could quote you chapter and verse from a thick stack of development statistics.

I could tell you that a little more than 200 years ago, [nearly half of all children born died](https://ourworldindata.org/child-mortality-in-the-past) before they reached their 15th birthday, and that today it’s [less than 5 percent globally](https://ourworldindata.org/child-mortality-in-the-past#historical-estimates-of-mortality). I could tell you that in pre-industrial times, starvation [was a constant specter](https://ourworldindata.org/extreme-poverty-in-brief#the-big-lesson-of-the-last-200-years-economic-growth-is-possible-poverty-is-not-inevitable) and life expectancy [was in the 30s at best](https://www.discovermagazine.com/health/when-did-humans-start-to-get-old). I could tell you that at the dawn of the 19th century, barely more than [one person in 10 was literate](https://ourworldindata.org/a-history-of-global-living-conditions-in-5-charts#literacy), while today that ratio has been nearly reversed. I could tell you that today is, on average, the best time to be alive in human history.

But that doesn’t mean you’ll be convinced.

In [one 2017 Pew poll](https://www.pewresearch.org/global/2017/12/05/worldwide-people-divided-on-whether-life-today-is-better-than-in-the-past/), a plurality of Americans — people who, perhaps more than anywhere else, are heirs to the benefits of centuries of material and political progress — reported that life was better 50 years ago than it is today. A [2015 survey](https://ourworldindata.org/uploads/2016/12/Optimistic-about-the-future-2.png) of thousands of adults in nine rich countries found that 10 percent or fewer believed that the world was getting better. On the internet, [a strange nostalgia persists](https://www.theatlantic.com/health/archive/2022/05/medieval-history-peasant-life-work/629783/) for the supposedly better times before industrialization, when [ordinary people supposedly worked less](https://twitter.com/AzieDee/status/1515333667849080835?s=20&t=BVVAz-dg95Z4LpX90s0mPg) and life was allegedly [simpler and healthier](https://www.dailymail.co.uk/sciencetech/article-7040709/Medieval-peasants-England-lived-hearty-diet-meat-vegetables-cheese.html). (They [didn’t](https://mobile.twitter.com/jmhorp/status/1617529270364172292) and it [wasn’t](https://www.economist.com/special-report/2019/01/03/in-the-middle-ages-there-was-no-such-thing-as-childhood).)

Looking backward, we imagine a halcyon past that never was; looking forward, it seems to many as if, in the words of young environmental activist Greta Thunberg, [“the world is getting more and more grim every day.”](https://www.nytimes.com/2023/02/08/opinion/greta-thunberg-climate-change.html)

So it’s boom times for doom times. But the apocalyptic mindset that has gripped so many of us not only understates how far we’ve come, but how much further we can still go. The real story of progress today is its remarkable [expansion to the rest of the world in recent decades](https://www.brookings.edu/blog/future-development/2015/12/03/the-great-surge-of-development-progress-and-the-growing-threats-that-could-derail-it/). In 1950, life expectancy in Africa [was just 40; today, it’s past 62](https://ourworldindata.org/life-expectancy#life-expectancy-has-improved-globally). Meanwhile more than 1 billion people have [moved out of extreme poverty](https://blogs.worldbank.org/developmenttalk/end-extreme-poverty-getting-back-pre-covid-19-reduction-rates-not-enough#:~:text=From%201990%20to%202014%2C%20the,in%202014%20(Figure%201).) since 1990 alone.

But there’s more to do — much more. That hundreds of millions of people [still go without the benefit of electricity](https://www.iea.org/commentaries/for-the-first-time-in-decades-the-number-of-people-without-access-to-electricity-is-set-to-increase-in-2022) or live in states still [racked by violence and injustice](https://fragilestatesindex.org/) isn’t so much an indictment of progress as it is an indication that there is still more low-hanging fruit to harvest.

The world hasn’t become a better place for nearly everyone who lives on it because we wished it so. The astounding economic and technological progress made over the past 200 years has been the result of deliberate policies, a drive to invent and innovate, one advance building upon another. And as our material condition improved, so, for the most part, did our morals and politics — not as a [side effect, but as a direct consequence](https://scholar.harvard.edu/files/bfriedman/files/the_moral_case_for_growth.pdf). It’s simply easier to be good when the world isn’t zero-sum.

Which isn’t to say that the record of progress is one of unending wins. For every problem it solved — the lack of usable energy in the pre-fossil fuel days, for instance — it often created a new one, like climate change. But just as a primary way climate change is being addressed is [through innovation that has drastically reduced the price of clean energy](https://twitter.com/scienceisstrat1/status/1619731643861975040?utm_source=substack&utm_medium=email), so progress tends to be the best route to solving the problems that progress itself can create.

Though historians still argue over what the writer Jason Crawford calls “[the roots of progress](https://rootsofprogress.org/),” the fundamental swerve was the belief that, after eons of relatively little meaningful change, the future could actually be different, and better. But the doomerism that risks overtaking us erodes that belief, and undercuts the policies that give it life.

The biggest danger we face today, if we care about actually making the future a more perfect place, isn’t that industrial civilization will choke on its own exhaust or that democracy will crumble or that AI will rise up and overthrow us all. It’s that we will cease believing in the one force that raised humanity out of tens of thousands of years of general misery: the very idea of progress.

**How progress solves the problems we didn’t know were problems**

Progress may be about where we’re going, but it’s impossible to understand without returning to where we’ve been. So let’s take a trip back to the foreign country that was the early years of the 19th century.

In 1820, according to [data compiled by the historian Michail Moatsos](https://www.oecd-ilibrary.org/sites/e20f2f1a-en/index.html?itemId=/content/component/e20f2f1a-en), about three-quarters of the world’s population earned so little that they could not afford even a tiny living space, some heat and, hopefully, enough food to stave off malnutrition.

It was a state that we would now call “extreme poverty,” except that for most people back then, it wasn’t extreme — it was simply life.

What matters here for the story of progress isn’t the fact that the overwhelming majority of humankind lived in destitution. It’s that this was the *norm*, and had been the norm since essentially… forever. Poverty, illiteracy, premature death — these weren’t problems, as we would come to define them in our time. They were simply the background reality of being human, as largely unchangeable as birth and death itself. And there were only the slightest inklings at the time that this could or should change.

But those inklings were there, and over time, they began to take root. The Scientific Revolution [began in the 1500s](https://rootsofprogress.org/relationship-of-the-scientific-and-industrial-revolutions), as figures like the English philosopher Francis Bacon [introduced the idea](https://rootsofprogress.org/the-baconian-program) that through trial and experimentation, scientific knowledge could be advanced, and with it, the human condition itself.

Over time, the abstract concepts and discoveries of the Scientific Revolution led to the machines and raw power of what would be dubbed the Industrial Revolution; to [James Watts’s steam engine](https://rootsofprogress.org/james-watts-steam-engine) and [Michael Faraday’s electric generator](https://rootsofprogress.org/when-to-be-surprised-an-invention-took-so-long) and Richard Arkwright’s Cromford Mill, the [progenitor of the modern factory](https://rootsofprogress.org/out-of-whole-cloth).

Advances in our ability to [generate energy](https://ourworldindata.org/energy-production-consumption#how-much-energy-does-the-world-consume), advances in our ability to [harness that energy for work](https://ourworldindata.org/grapher/gdp-vs-manufacturing-gdp), and advances in our ability to [create an economic system](https://www.jstor.org/stable/24232428) that got the most out of both of those factors all intermingled. And that is when human life began to truly change, in a way that was so massive and, eventually, so all-encompassing, that we still struggle to grasp its sheer scale. Economic historian Deirdre McCloskey has simply [dubbed it](https://www.deirdremccloskey.com/articles/bd/greatfact.php) “the Great Fact.”

The simplest fact about the Great Fact might be this: Without it, chances are I wouldn’t be writing this article and you wouldn’t be reading it

In his 2022 book [*Slouching Towards Utopia: An Economic History of the 20th Century*](https://bookshop.org/products/slouching-towards-utopia-an-economic-history-of-the-twentieth-century-j-bradford-delong/17984370?gclid=CjwKCAiA_6yfBhBNEiwAkmXy51jAAcXwBo3dNnPa6EvhP7XOuiYQRcjpQUpCDw_68O-5TBwt5cg4dhoCBKEQAvD_BwE), the economic historian Brad DeLong [uses a simple data point](https://www.vox.com/future-perfect/2022/9/7/23332699/economic-growth-brad-delong-slouching-utopia) to describe just how much progress occurred after 1870, once the advances of the Industrial Revolution had been fully consolidated and political improvements began to follow economic ones.

In 1870, an average unskilled male worker in London could earn enough per day to buy 5,000 calories worth of food for himself and his family. That was more than in 1600, but not significantly more, and not enough to easily feed everyone consistently, given that mean household size in England at the time [was just under five people](https://pubmed.ncbi.nlm.nih.gov/22077606/).

By 2010 — the end of what DeLong in his book called “the long twentieth century” — that same worker could afford to buy the equivalent of *2.4 million calories* of food per day, a nearly 50,000 percent increase.

The simplest fact about the Great Fact might be this: Without it, chances are I wouldn’t be writing this article and you wouldn’t be reading it.

Between 10,000 BCE and 1700, the [average global population growth rate](https://ourworldindata.org/world-population-growth#world-population-from-10-000-bce-to-today) was just 0.04 percent per year. And that wasn’t because human beings weren’t having babies. They were simply dying, in great numbers: [at birth](https://www.vox.com/the-highlight/23542710/population-growth-birth-rates-fertility-rates-democrats-republicans-climate-change), [giving birth](https://www.journals.uchicago.edu/doi/abs/10.1086/701476?journalCode=ca), [in childhood](https://ourworldindata.org/child-mortality-in-the-past#:~:text=The%20average%20across%20a%20large,reached%20the%20end%20of%20puberty.) from now-preventable diseases, and in [young adulthood](https://ourworldindata.org/ethnographic-and-archaeological-evidence-on-violent-deaths) from now-preventable wars and violence.

We were stuck in the [Malthusian Trap](https://www.economicsonline.co.uk/managing_the_economy/what-is-the-malthusian-theory-of-population.html/#:~:text=The%20Malthusian%20Trap%2C%20also%20known,techniques%20creates%20higher%20population%20levels.), named after the 18th-century English cleric and economist Thomas Malthus. The trap argues that any increase in food production or other resources that allowed the population to grow was quickly consumed by that increased population, which then led to food shortages and population decline.

(It’s striking that one of the few real spikes in wages and standard of living in pre-industrial times [came in the aftermath](https://history.wustl.edu/news/how-black-death-made-life-better) of the Black Death, which killed off [perhaps 30 percent](https://www.americanscientist.org/article/the-bright-side-of-the-black-death#:~:text=The%20Black%20Death%20was%20so,when%20the%20plague%20reached%20London.) of Europe’s population. Those who survived were able to command higher wages to work empty land — but a deadly pandemic is no reasonable person’s idea of a sustainable economic growth program.)

Viewed from one angle, the human population before the Industrial Revolution was in an ecological balance of the sort we might aim to preserve if humanity were just another wild species plowing its environmental niche, its numbers kept in check by violence, disease, and starvation.

But that nearly flat line of population growth, century after century, hides an untellable story of misery and suffering, one of children dead before their time, of families snuffed out by starvation, of potential and of people that would never have the chance to be realized. It was a story, as the writer Bill Bryson [has put it](https://www.thestar.com/entertainment/books/2010/10/07/at_home_bill_bryson_considers_where_we_live.html), of “tiny coffins.”

In the poorer countries of sub-Saharan Africa, progress has been slower and later, but shouldn’t be underestimated

It was only with the progress of industrialization that we broke out of the Malthusian Trap, producing enough food to feed the mounting billions, enough scientific breakthroughs to conquer old killers like smallpox and the measles, and enough political advances to dwindle violent death.

Between 1800 and today, our numbers [grew](https://ourworldindata.org/world-population-growth#world-population-from-10-000-bce-to-today) from around 1 billion to 8 billion. And that 8 billion aren’t just healthier, richer, and better educated. On average, they can expect to [live more than twice as long](https://ourworldindata.org/life-expectancy#twice-as-long-life-expectancy-around-the-world). The writer Steven Johnson [has called](https://www.nytimes.com/2021/05/11/books/review/extra-life-steven-johnson.html) this achievement humanity’s “extra life” — but that extra isn’t just the decades that have been added to our lifespans. It’s the extra people that have been added to our numbers. I’m probably one of them, and you probably are too.

The Malthusian Trap isn’t easy to escape, and the progress we’ve earned has hardly been uninterrupted or perfectly distributed. The past two centuries have seen by far [the bloodiest conflicts in human history](https://borgenproject.org/top-12-deadliest-wars-in-history/), punctuated by the invention of weapons that could [conceivably end humanity](https://www.existentialriskobservatory.org/nuclear-war/#:~:text=There%20is%20a%20possibility%20that,for%20the%20next%20hundred%20years.). Well into the 20th century, [billions still lived lives](https://ourworldindata.org/grapher/gdp-per-capita-maddison-2020) that were materially little different from their impoverished ancestors.

But if progress hasn’t yet fully broken the Malthusian Trap physically, it did so psychologically. Once we could prove in practice that the lot of humanity didn’t have to be hand-to-mouth existence, we could see that progress could continue to expand.

The long twentieth century came late to the Global South, but it did get there. Between 1960 and today, India and China, together home to nearly [one in every three people](https://www.pewresearch.org/fact-tank/2022/07/21/global-population-projected-to-exceed-8-billion-in-2022-half-live-in-just-seven-countries/) alive today, have seen life expectancy rise from [45 to 70](https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=IN) and [33 to 78](https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=CN), respectively. Per-capita GDP over those years [rose some 2,600 percent](https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=IN) for India and an [astounding 13,400 percent for China](https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=CN), with the latter lifting an estimated [800 million people out of extreme poverty](https://www.worldbank.org/en/news/press-release/2022/04/01/lifting-800-million-people-out-of-poverty-new-report-looks-at-lessons-from-china-s-experience).

In the poorer countries of sub-Saharan Africa, progress has been slower and later, but shouldn’t be underestimated. When we see the [drastic decline in child mortality](https://data.unicef.org/wp-content/uploads/2023/01/UN-IGME-Child-Mortality-Report-2022_Final-online-version_9Jan.pdf) — which has fallen since 1990 from 18.1 percent of all children in that region to 7.4 percent in 2021 — or the [more than 20 million measles deaths](https://www.theatlantic.com/newsletters/archive/2022/09/bill-melinda-gates-foundation-goalkeepers-report-poverty/671415/) that have been prevented since 2000 in Africa alone, this is progress continuing to happen now, with the benefits overwhelmingly flowing to the poorest among us.

The simplest argument for why we need to continue to build on that legacy is found in the places where it has continued to fall short. The fact that as of 2016 some 13 percent of the world [still lacked access to electricity](https://ourworldindata.org/energy-access) — the invisible foundation of modernity — is just as worthy of our worry. The fact that 85 percent of the world — a little less than 7 billion people — lives on [less than $30 a day](https://ourworldindata.org/extreme-poverty-in-brief) should keep us awake at night.

Because that, as much as any existential challenge we fear hurtling toward us, shouldn’t simply be accepted as inevitable.

**How progress can solve the problem of being human**

On January 6, 1941 — 11 months before Pearl Harbor — President Franklin Delano Roosevelt gave his State of the Union speech. But it’s better known by another name: the [Four Freedoms speech](https://www.youtube.com/watch?v=yD32o5zqe7M).

As much of the world was engulfed in what would become the greatest and bloodiest conflict in human history, Roosevelt [told Congress](https://voicesofdemocracy.umd.edu/fdr-the-four-freedoms-speech-text/) that “we look forward to a world founded upon four essential human freedoms”: freedom of speech, freedom of worship, freedom from want, and freedom from fear.

There are human values that can’t be captured in dry economic statistics: life, liberty, the pursuit of happiness. If our world had somehow become as rich and as long-lived as it is today with a system of political liberties and human rights frozen in 1820, we might barely consider it progress at all.

Except that we have seen startling improvements in everything from political liberty to democratic representation to human rights to even the way we treat some (if not all) animals.

In 1800, according to Our World in Data, [zero — none, nada, zip — people lived](https://ourworldindata.org/grapher/people-living-in-democracies-autocracies?country=~OWID_WRL) in what we would now classify as a liberal democracy. Just 22 million people — about 2 percent of the global population — lived in what the site classifies as “electoral autocracies,” meaning that what democracy they had was limited, and limited to a subset of the population.

One hundred years later, things weren’t much better — there were actual liberal democracies, but fewer than 1 percent of the world’s population lived in them.

All you have to do is roll the clock back a few decades to see the way that rights, on the whole, have been extended wider and wider: to LGBTQ citizens, to people of color, to women

But in the decades that followed FDR’s “Four Freedoms” speech, things changed radically, thanks to the defeat of fascist powers, the spread of civil rights within existing democracies, and eventually, the collapse of the communist world.

That doesn’t mean that the liberal democracies that exist are perfect by any means, the US very much included. Nor does it mean that periods of advancement weren’t followed by periods of retrenchment or worse. Progress, especially in politics and morals, doesn’t flow as steadily as a calendar — just compare Germany in 1929 to Germany in 1939.

But all you have to do is roll the clock back a few decades to see the way that rights, on the whole, have been extended wider and wider: to LGBTQ citizens, to people of color, to women. The fundamental fact is that as much as the technological and economic world of 2023 would be unrecognizable to people in 1800, the same is true of the political world.

Nor can you disentangle that political progress from material progress. Take the gradual but definitive emancipation of women. That has been a hard-fought, ongoing battle, chiefly waged by women who saw the inherent unfairness of a male-dominated society.

But it was [aided by the invention of labor-saving technologies](https://www.vox.com/future-perfect/2020/11/10/21363336/vegan-meat-alternatives-technology-melanie-joy) in the home like washing machines and refrigerators that primarily gave time back to women and [made it easier for them to move into the workforce](https://www.sciencedaily.com/releases/2009/03/090312150735.htm).

These are all examples of the [expansion of the circle of moral concern](https://www.npr.org/sections/13.7/2016/11/15/501972594/expanding-the-circle-of-moral-concern) — the enlargement of who and what is considered worthy of respect and rights, from the foundation of the family or tribe all the way to humans around the world (and increasingly [non-human animals as well](https://www.vox.com/future-perfect/2022/9/12/23339898/global-meat-production-forecast-factory-farming-animal-welfare-human-progress)). And it can’t be separated from the hard fact of material progress.

The pre-industrial world was a zero-sum one — that, ultimately, is what the Malthusian Trap means. In a zero-sum world, you advance only at the expense of others, by taking from a set stock, not by adding, which is why wars of conquest between great powers [were so common hundreds of years ago](https://ourworldindata.org/war-and-peace#the-past-was-not-peaceful), or why homicide between neighbors was [so much more frequent in the pre-industrial era](https://slides.ourworldindata.org/war-and-violence/#/3).

We have obviously not eradicated violence, [including by the state itself](https://www.vox.com/policy-and-politics/23574206/tyre-nichols-death-bodycam-video-memphis-police-release). But a society that can produce more of what it needs and wants is one that will be less inclined to fight over what it has, either with its neighbors or with itself. It’s not that the humans of 2023 are necessarily better, more moral, than their ancestors 200 or more years ago. It’s that war and violence cease to make economic sense.

But just as [every bloody day of the Russia-Ukraine war](https://www.rand.org/latest/russia-ukraine.html) demonstrates that moral and political progress hasn’t eradicated our violent tendencies, the material progress that has helped meet our most basic needs has opened the door to new, knottier problems: to [climate change](https://www.vox.com/energy-and-environment/23458617/cop27-fossil-fuels-energy-developing-countries-coal-oil-gas-africa-finance) caused by industrialization, to the [ills of a longer-lived society,](https://www.who.int/news-room/fact-sheets/detail/ageing-and-health#:~:text=Common%20conditions%20in%20older%20age,conditions%20at%20the%20same%20time.) to the [mental health challenges](https://www.vox.com/23013483/mental-health-pandemic-young-people-sapien-labs) that arise once we no longer need to worry about surviving and instead need to worry about living.

And with it comes the temptation to turn back and give in.

**How progress creates new problems — and solves them anew**

On September 7, 1898, just as the world was finally escaping the Malthusian Trap, the chemist William Crookes [told the British Association for the Advancement of Science](https://www.jstor.org/stable/1627238) that we were in danger of falling back into it.

According to Crookes, the UK’s [rapidly growing population](https://ourworldindata.org/grapher/population-of-england-millennium) was at risk of running out of food. There wasn’t more room for additional farmland on the isles, which meant the only way to increase the food supply was to boost agricultural productivity. That required nitrogen fertilizer, but existing supplies of nitrogen at the time came from natural sources like guano deposits in Peru, and they were running out. The world faced, he said, “a life-and-death question for generations to come.”

On the face of it, this appeared to be Malthus’s revenge. The British population had exploded, but now it was meeting its natural limits, and nature’s correction was coming.

But Crookes had a solution, one he believed we could literally pull out of thin air. The Earth’s atmosphere is [78 percent nitrogen](https://climate.nasa.gov/news/2491/10-interesting-things-about-air/#:~:text=The%20air%20in%20Earth%E2%80%99s%20atmosphere,dioxide%2C%20neon%2C%20and%20hydrogen.). Crookes challenged his audience to develop a way for humanity to artificially fix atmospheric nitrogen in a way that could be used to create synthetic nitrogen fertilizer, and with it, produce enough food for Britain and the world.

Less than 20 years later, two German scientists managed to do just that, developing the Haber-Bosch process to synthesize ammonia out of atmospheric nitrogen and hydrogen, which became a cornerstone of synthetic fertilizer. Combined with the increasing mechanization of agriculture, food production kept growing, and now it’s estimated that half the population alive today [is dependent on the existence of synthetic fertilizer](https://ourworldindata.org/fertilizers#how-many-people-does-synthetic-fertilizer-feed).

Viewed from this angle, the story of synthetic fertilizer from Crookes to Haber and Bosch is one of just-so progress, of technological advancement rising to meet growing need. And so it is.

But the story doesn’t stop there. The synthetic fertilizer industry produces about [2.6 gigatons of carbon per year](https://phys.org/news/2023-02-carbon-emissions-fertilizers.html#:~:text=Their%20analysis%20found%20that%20manure,need%20for%20global%20food%20security.) — more than aviation and shipping combined. Its abundance has led to overapplication, so much so that about [two-thirds of the nitrogen](https://ourworldindata.org/excess-fertilizer#nearly-two-thirds-of-applied-nitrogen-is-not-used-by-our-crops) farmers apply to crops isn’t used by plants at all, but rather becomes run-off into the surrounding environment as a pollutant, [causing dead zones](https://www.epa.gov/nutrientpollution/effects-dead-zones-and-harmful-algal-blooms#:~:text=Dead%20zones%20are%20generally%20caused,time%2C%20also%20called%20algae%20blooms.) like the massive one found in the Gulf of Mexico. Oh, and Fritz Haber himself later [dedicated his career](https://www.smithsonianmag.com/history/fritz-habers-experiments-in-life-and-death-114161301/) to developing chemical weapons that would kill thousands in World War I.

So the Haber-Bosch process solved one problem, while creating new ones.

That’s the story of progress as well.

In fact, you’d be hard pressed to find a single scientific or technological advancement that doesn’t create an element of blowback. Breakthroughs in nuclear physics made possible the creation of zero-carbon nuclear plants — and also, the nuclear bombs that still hold the world hostage.

The introduction of antibiotics may have added as much as [eight years to global life expectancy](https://www.abc.net.au/science/slab/antibiotics/history.htm), but the more they’re used, the more resistance builds up, paving the way for the [next potential pandemic of antibiotic-resistant infections](https://www.science.org.au/curious/policy-features/next-pandemic-antimicrobial-resistance).

Striking gains in agricultural productivity have [eliminated the threat of famine](https://ourworldindata.org/famines) in all but the poorest countries, but also contributed to a problem that was basically unheard of until recently: [widespread obesity](https://www.who.int/health-topics/obesity#tab=tab_1).

Advances in animal breeding and diet have made [meat cheap and widespread](https://www.vox.com/future-perfect/2023/2/10/23589333/cecile-steele-chicken-meat-poultry-eggs-delaware), but at the cost of [local pollution](https://www.vox.com/future-perfect/2022/4/22/23036010/eat-less-meat-vegetarian-effects-climate-emissions-animal-welfare-factory-farms) and the creation of a factory farming system that sentences billions of domesticated animals to [lives of terrible suffering](https://www.vox.com/future-perfect/2022/9/12/23339898/global-meat-production-forecast-factory-farming-animal-welfare-human-progress).

Above all else is climate change. If there was a single material ingredient to the Industrial Revolution and all that followed, it was coal. Coal fired the factories, coal fueled the railroads, coal made industrialization happen. It’s still coal, along with other fossil fuels like oil and natural gas, that provides the [bulk of global energy consumption](https://ourworldindata.org/energy-mix) — energy consumption that has risen more than 3,000 percent since 1800.

And coal and its fellow fossil fuels are by [far the top contributors](https://www.c2es.org/content/international-emissions/) to climate change. Coal helped create progress, and coal helped create climate change. And if the story ended there, it might be reasonable to look at progress very differently. It might even be reasonable to agree with [de-growthers](https://www.vox.com/future-perfect/22408556/save-planet-shrink-economy-degrowth) whose demand, at the end of the day, is that we must stop economic growth and throw it in reverse, or face doom.

But the story doesn’t end there.

The solutions produced by progress create new problems, but almost every time, we’ve managed to find new solutions.

The Haber-Bosch process created the new problem of fertilizer overapplication and pollution, but smart agriculture can get the same or greater crop yields with less fertilizer — a change that is [already underway](https://ourworldindata.org/reducing-fertilizer-use) — while synthetic biology offers the promise of engineering crops that can [effectively fertilize themselves](https://geneticliteracyproject.org/2016/09/20/324380/).

Before the Industrial Age, we lived in balance, but that balance, for the bulk of humanity, was a terrible place to be — worse, by many measures, than any future we could fear

Obesity has proven to be a stubbornly resistant health problem, but new drugs and surgical treatments are poised to [make it easier to lose weight](https://www.vox.com/science-and-health/23584679/ozempic-wegovy-semaglutide-weight-loss-obesity) even in an environment where food is everywhere.

Climate change will be the most difficult challenge of all, but progress is bringing down the cost of renewable energy, reducing energy waste, and putting new forms of cleaner energy on the horizon. Progress — and that is the word — on climate policy and innovation has already [bent the curve away from the worst-case climate scenarios](https://www.scientificamerican.com/article/the-worst-climate-scenarios-may-no-longer-be-the-most-likely/). We’re not on course for utopia, but we [no longer appear](https://www.nytimes.com/interactive/2022/10/26/magazine/climate-change-warming-world.html) to be headed toward doom either. (At least, not this particular doom.)

Before the Industrial Age, we lived in balance, but that balance, for the bulk of humanity, was a terrible place to be — worse, by many measures, than any future we could fear. With industrialization, after tens of thousands of years on this planet, we began to change that.

But we also began a race: Could we keep inventing new technologies, new approaches, that would keep us ahead of the new challenges that progress created? Could we keep solving the problems of success?

So far, the answer has been a qualified yes. Past performance is no guarantee of future results, but we have every reason to believe that we have far more race to run.

That race can feel exhausting, even pathological — the endless sentence of a species that can never seem to be satisfied. Doomerism, at its heart, may be that exhaustion made manifest.

But just as we need continued advances in clean tech or biosecurity to protect ourselves from some of the existential threats we’ve inadvertently created, so do we need continued progress to address the problems that have been with us always: of want, of freedom, even of mortality. Nothing can dispel the terminal exhaustion that seems endemic in 2023 better than the idea that there is so much more left to do to lift millions out of poverty and misery while protecting the future — which is possible, thanks to the path of the progress we’ve made.

And we’ll know we’re successful if our descendants can one day look back on the present with the same mix of sympathy and relief with which we should look back on our past. How, they’ll wonder, did they ever live like that?