Chapter 1

Humanity

There are only four ways to reduce the emissions of greenhouse gases:

- 1. We can reduce the number of people on the planet.
- 2. We can reduce how much energy each of us consumes by reducing our economic activities for example, by working, producing, and consuming less.
- 3. We can improve the energy efficiency of our economic activities, reducing how much energy each of our activities consumes for example, by insulating our buildings better.
- 4. We can improve the emissions efficiency of our energy use for example, by switching from coal to solar cells.

That's it. The list is exhaustive. There are no other alternatives. All more specific proposals have to work through one or more of these four categories.¹

We will start our book with the first of these four levers — population.

¹This decomposition is essentially due to the Japanese economist Yoichi Kaya. We will return to each of the components repeatedly in the first part of our book.

1 Capitalism and Population

Many environmentalists believe that the emissions problem must be solved via #2, a reduction of our economic activities. They believe that capitalism is unsustainable and greed lies at the core of our planet's global climate problem. It is the desire of the wealthy to consume more that is responsible for endangering our planet. And it is why fossil fuels kill millions every year. (The latter part of the statement is correct. Fossil fuels indeed kill millions of us with their small particle emissions.)

Many of their proposed solutions want to tamper with civilization, society, and modern industry for the sake of a greater good. Unfortunately, they misunderstand the problem (and capitalism). This is because the most important cause of the problem is not capitalism.

Instead, the most important cause has been and will continue to be *us*. That is, the world's problem is mostly #1, not #2 from the list above — you and us and 8 billion other human beings. And the large human population is mostly not a rich-country problem. The richer countries of the OECD house only a small minority of us. It is the poorer countries outside the OECD that house the majority of us.

To the extent that environmentalists are correct that increasing per-capita consumption causes more environmental degradation, the problem has been and will continue to be primarily about poorer people. They desire reasonable living standards. They want to be able to commute to jobs that allow them to send their kids to school, have basic lighting and sanitation, and boil water when they want to.

On a planetary scale, human emissions are no longer primarily a problem of providing luxury goods for the wealthy few in rich countries, housing 1–2 billion people now. They are primarily a problem of delivering healthier living standards to the 6–7 billion people in poor countries.

Our list of possible levers also included two efficiency improvements, specifically energy efficiency (#3) and emission efficiency (#4). These items are already seeing a lot of progress. The great hope of humanity is the second of these — clean energy — and we will cover clean technologies in great detail later in the book.

But we are getting ahead of ourselves. Let's start with the most important factor, population. It's a big topic.

2 The Population Explosion





Note: The part with the gray background is history. The part with the red line over white background is the forecast to 2100. A reasonable forecast for 2100 is about 10–11 billion people. The graph is deliberately not drawn on a logarithmic scale. This is because the planet has a fixed scale.

Source: United Nations and worldometers.info.

Let us start by looking at the history of our planet's population. Figure 1 shows that even as recently as 5,000 BC — almost 200,000 years after the rise of <u>homo sapiens</u> — the human population was still tiny, approximately <u>5</u> <u>million</u> people. Around the time of the Han, Mayan, Parthian, and Roman empires, the planet hosted about 150–200 million people. By the end of the Middle Ages, it stood around 400 million. Humanity's impact on the global environment was still largely negligible — though humanity was not as innocuous as often imagined. We probably did manage to wipe out some species — not only the <u>large edible kind</u>, like <u>Woolly Mammoths</u> and <u>Ground Sloths</u>, but also other human species like <u>Neanderthals</u> and <u>Denisovans</u>; and humans converted forests and <u>peatlands</u> into fields and pastures.

The slow growth of humanity — often interrupted by wars and diseases — continued largely unchanged until around the time of the U.S. and French revolutions. At that point, Earth hosted about 1 billion people. You should not feel nostalgic about these bygone days. It was not a pastoral landscape of peace and harmony. The vast majority of humans lived short lives at or below subsistence level. Hunger was prevalent. Pandemics were common. Technology was rudimentary. Transportation was cumbersome. Communication took days. Heating was minimal. Cooling was (mostly) unavailable. As late as 1900, global average life expectancy was still only <u>31</u> years, although this figure was so low mostly because of deaths at child-birth. Today, global life expectancy is more than twice that, <u>72 years</u>. We are richer than ever before. Beyond the poorest 2 billion, the average person alive today has resources that even a monarch as late as the eighteenth century could only have dreamed of.



Around 1800, world population growth switched into high gear. It was not the prominent political revolutions of the era that were responsible. Instead, it was the second agricultural revolution (mostly crop rotation but also newer tools and breeds), the hygiene revolution, the industrial revolution, and the medical revolution (probably in that order). Human population accelerated. But the human impact was still not a meaningful environmental problem for at

least another century. By 1900, the world population was still "only" 1.6 billion — easily supportable by our planet and its natural resources. Population was still by-and-large limited by food availability.

Then population growth went into overdrive. Especially in developing countries, <u>mortality declined</u> with the advent of modern hygiene, medicine, and agricultural fertilizers, but birth rates did not. By 1960, the world's population was 3 billion. Less than 15 years later, it had reached 4 billion. **Today, the world has a population of about 8 billion people.**

Human population growth has simply been mind-blowing. From 1900 to today, humanity has added over 6 billion people. The United Nations now expects population to level off at around <u>11 billion</u> by the end of the century — still 40% more than we have today. (However, some other forecasts are as low as <u>10 billion</u>.)

Unlike us, with our exponential growth, the planet does not grow. Human ingenuity has nevertheless made it possible to expand many resource

2. THE POPULATION EXPLOSION

constraints. Yet we billions of people seem just about ready to push against other fixed planetary constraints sometime soon. As recently as <u>50 years ago</u>, many scientists thought that humanity would soon run out of food or fossil fuels. This will almost surely not happen, although it is true that humans are ravaging our ecosystems and extinguishing species at a record pace (especially the oceans, which are a free-for-all, not owned or protected by anyone). Instead, it now looks as if we could run out of clean air, clean oceans, and healthy ecosystems first. Almost no one worried about these specific global environmental constraints just 50 years ago.

anecdote

In a satirical <u>commercial</u> by <u>The Onion</u>, people can lower their carbon footprints by getting into the "<u>Toyota Prius Solution</u>," which then drives a stake through their hearts. The narrator exclaims "When you're dead, you can't pollute!"

Burgeoning population growth is also a principal cause of our climate problem. If our leaders had managed to curtail population growth in 1960 (at 3 billion), then stopping climate change would be much easier. If they could curtail it now, it would be as important a contribution to humanity's future as newer and cleaner technologies.

Indeed, it is not even the case that global emissions (especially in wealthier OECD countries) have grown a lot worse over the last half century *when measured on a per-capita basis*. (There are exceptions.) Instead, it is primarily the *global capita* that



have increased — indeed, quadrupled. When calculating planet-wide energy consumption and emissions, we now have to multiply by 8 billion instead of 2 billion — and soon by 10-11 billion.

Note that we are not arguing that the planet cannot sustain 10 billion people. Indeed, most scientists believe that it can. But contemplate this: most population growth and increasingly negative environmental impacts occur in poor countries and not in rich industrialized countries. It is in Africa that humanity is experiencing the most suffering and not in Western Europe. This brings us to the next topic — regional variation.

3 Regional Population Variation

To understand global population growth, we need to look at where it has occurred and where it will continue. Figure 2 shows where humanity has settled. Contrary to casual Western impressions, most people now live on the Indian subcontinent, in South-East Asia, and in Sub-Saharan Africa.

Figure 2. World Population



Source: <u>World Population History</u>, which also offers an even more interesting map animated over time. Each dot is 1 million people.

China, India, and Africa housed about 1.5 billion people each in 2022. Other Asian countries accounted for an additional 1.1 billion people.

The U.S. and Europe together accounted for only about 1 billion. Our Western perception of the world is too ethnocentric. We are less important than we like to think — both in our ability to cause problems and in our ability to fix them.

4 Rich and Poor: OECD and non-OECD

A useful categorization of countries is whether they are part of the <u>Organisation</u> for <u>Economic Co-operation and Development</u> (OECD) or not. The former are representative of the richest and economically most developed countries. This is not to say that there are rich countries that are not in the OECD (e.g., Quatar) and medium-income countries that are in the OECD (e.g., Mexico). However, the two categories are common enough to make them good standins for broader categories and their statistics are particularly easy to come by.

	Population (billion)	<u>GDP (PPP)</u> (US-\$)	Energy (PWh)	Emissions (GtCO ₂)
OECD	1.4	60	71	12
not OECD	6.5	75	116	24
% OECD	18%	44%	38%	33%

In 2022, according to the U.S. Energy Information Administration (EIA),

(We will cover the non-population aspects of this table in the next chapters.)

The important point here is that the OECD accounted for less than 20% of the population on the planet, but produced and consumed about 2–3 times its "fair" share. If the point of our book was to assign blame, it would be time to start finger-pointing. But it is not.

The point of our book is to consider viable solutions to reduce total global human greenhouse gas emission, as listed in the last column of the table. And even a casual glance at these numbers makes it clear that the OECD can no longer go it alone. OECD emissions are no longer the majority. In all respects, the OECD is already a minority player.

But it's actually worse than this: the non-OECD countries are still growing a lot faster in all columns compared to the OECD countries. Within one generation, the EIA estimates that the same table will look like this:

	Population (billion)	<u>GDP (PPP)</u> (US-\$)	Energy (PWh)	Emissions (GtCO ₂)
OECD	1.5	92	82	12
not OECD	8.2	191	177	31
% OECD	15%	33%	32%	28%

Comparing the two tables, you can see that population and emission growth have essentially stopped in the OECD. (Population growth is being propped up only by immigration.) But population and emission growths have not stopped in non-OECD countries.

The numbers are stark. Even if the OECD unilaterally decided to extinguish itself, world emissions would still remain too high.







Where exactly will all the population growth occur? Figure 3 shows three snapshots of population.

In 1980, China and India were about one quarter each of the non-OECD population. The non-OECD population roughly doubled by 2022. China continued to increase its population but its share of population *growth* declined. India's population growth stayed the same at a very high level, and Africa's population growth increased.

Within one more generation, by 2050, the world will host another 1.8 billion of us. China's population will be shrinking. India's population will increase only modestly. Most population growth will come from Africa, a full

1.0 billion of the 1.8 billion (and even more in the generation beyond 2050). Africa's population growth is simply staggering. Nigeria alone had about 50 million people in 1965. It will have over 700 million people in 2050, almost as much as the USA and Western Europe combined! And about a third of the remaining 0.8 billion in population growth will occur in Pakistan, Indonesia, and Bangladesh.

In general, the poorer countries and regions are, the faster their populations grow.² It is here that the toughest environmental challenges will lie.

In fact, economists are often wondering whether accelerating the economic growth of the poorest countries would bring down their population growth rates quickly enough to reduce the environmental and other costs, relative to allowing them to remain poor for longer. (Unfortunately, regardless of what conclusion they might come up with, it is not easy to increase the wealth of poor nations. Despite decades of trying, the United Nation's foreign aid donation box has never managed to bring even one country out of poverty.)

5 Population Taboos

Population growth remains a vexing problem. Even if great steps were taken today, it would take many decades for it to stop. Population growth has self-momentum. In rapidly growing countries, the population is young. Their children today will often want to raise their own families within just another 20 years or so. This makes addressing the problem sooner rather than later even more urgent.

Yet even talking about how to slow population growth remains largely taboo. It raises difficult issues related to religion, imperialism, racism, ethnocentrism, culture, and parochialism. But discomfort does not make facts vanish: Humanity is still expanding and our planet is not. Earth remains in fixed supply. Africa and other poor regions are "overtaxed."

The most important shining beacon when it comes to curbing population growth have been improvements in womens' rights, especially greater access

²Ironically, richer countries will be struggling with the effects of shrinking population — and they generally do not like the partial solution of allowing more immigration from poorer countries.

to professional careers and birth control. (Other lights have been increasing education and secularization.) These factors have led to declining birth rates in many rich countries, which in turn have changed the character of families and societies.³ Children have become fewer, and adults and seniors have been becoming the majority.

When countries undergo this change, it is called the "<u>fertility transition</u>." A glaring empirical fact is that — except for a few unusually oil-rich Arab states — only countries that have undergone the fertility transition enjoy high-quality lifestyles today, and vice-versa.

If we want civilization and our biosphere to remain sustainable, the world must get its population under control — the sooner the better. Countries that have not yet done so must undergo the fertility transition. To do so, they will have to become richer — and perhaps more "<u>modern</u>." But such economic development requires more resources and energy consumption per capita upfront, which in turn harms the planet sooner. It is a painful dilemma.

6 What Now?

In sum, for those environmentalists who long for a return to a time when humans lived in harmony with nature (those days <u>never</u> really existed) and consumed fewer resources and less energy (those days did exist), this time has passed. There is no going back.

Our civilization could simply not sustain eight billion people even at subsistence level without modern technology and energy — both agricultural and industrial. Short of unimaginably large human catastrophes, such as major nuclear wars or pandemics, our economies will have to find a way to support us all. We eight billion are already here. Another two billion will join us within one generation. And most of us live in poor non-OECD countries and deserve better.

Because we know of no ways to drastically reduce the human population, the best and most humane hope for our civilizations is now sensible and

³It is also why dire predictions of populations always expanding to the point of widespread poverty will likely not hold in the very long term. Population-growth induced poverty was imagined by the economist <u>Thomas Robert Malthus</u> and is the reason why economics is often called "<u>The Dismal Science</u>."

6. WHAT NOW?

pragmatic environmentalism with painful compromises. That is what our book is about.

Before we move on from population to energy, you (our reader) should also ponder a novel political dimension here. The Internet now beams the West's rich lifestyles instantly to all parts of the globe. The global political situation is already a powder keg. It will only add more powder if



A Terrible Tragedy: A mass suicide of extinction rebellion protesters after realizing they were all breathing out CO_2 .

poorer people do not see their standards of living increase — and *soon*. This holds even more strongly for those countries and people who will be suffering harmful consequences of a planet that will be warmed perhaps not primarily but surely overproportionately by richer countries' energy consumption. Many young poor individuals are likely to become radicalized.

Some prominent environmentalists are on record having made some rather "interesting" population proposals. For example:
<u>Ted Turner</u>, billionaire, founder of CNN and major UN donor: "A total population of 250-300 million people, a 95% decline from present levels, would be ideal."
<u>David Foreman</u>, co-founder of <u>Earth First!</u>: "My three main goals would be to reduce human population to about 100 million worldwide, destroy the industrial infrastructure and see wilderness, with its full complement of species, returning throughout the world."
<u>David Brower</u>, a cofounder of the <u>Sierra Club</u>: "Childbearing should be a punishable crime against society, unless the parents hold a government license. All potential parents should be required to use contraceptive chemicals, the government issuing antidotes to citizens chosen for childbearing."

Yet, what can rich countries do? If poorer countries cannot reach the fertility transition (and they generally also resent interference by other countries), their standards of living cannot possibly increase quickly enough, even with all the development aid in the world. As already noted, the United Nation's donation box has also never helped countries escape poverty. And the last time that the Europeans intervened in Africa (the source of most future population growth), they killed millions. Belgium alone may have murdered 10 million Congolese. The locals will probably never again trust their good faith. Neither would we.

And who could blame poor individuals who want to join their wealthier neighbors? All they want is what we in richer countries assume to be our birth right.

7 We Are Most of The Problem

It is not an exaggeration to state that the number of humans on the planet is currently the most important underlying cause not just of global warming but of most environmental problems. These problems go way beyond the scope of our book. (And we also do not know how one could influence population growth.) Thus we limit the focus of our book "merely" to reductions in the emissions per capita for the sake of limiting climate change. It's more than big enough a problem!

A final word: it is all too easy for activists to point to, say, one million people for whom climate change will cause terrible suffering. Greenpeace has wonderful videos highlighting the fates that already are or will soon befall them — and Greenpeace is not lying, either. The fates of these people are not fair and you should not be callous about them. They don't deserve what they are getting.

But keep in mind that a million people are only about 0.1% of the human population. Almost 2,000 million people already live in <u>abject poverty</u> today, causing many to suffer and die from less spectacular causes. Economic growth is the only way out of this poverty. For the sake of humanity, even if the world could actively decide on a best policy (and we will argue that it really cannot), it should not base its policies only on the consequences for the 1 million and neglect the 2,000 million. Many things cannot be changed and for others, there are tough tradeoffs to be made. These are what our book is all about.

Further Readings

Clarifications:

Every chapter ends with further readings. Sources are listed in alphabetic order. When the title is not self-explanatory, we briefly try to explain the relevance. We do not necessarily share or endorse the views of further readings. It is sufficient if we find these readings interesting and relevant and not particularly badly biased, too polemic, or too political.

We will commonly refer to stories in certain news outlets in our book. <u>The Guardian</u> and the <u>Washington Post</u> are reliable center-left news outlets. The <u>Wall Street Journal</u>, <u>The</u> <u>Economist</u>, and <u>Bloomberg Businessweek</u> are reliable center-right news outlets. Our assessment of their centrism does not necessarily apply to their oped pages, which are run by completely different teams. Other outlets have little detectable bias in their climate coverage, such as <u>Ars</u> <u>Technica</u> (or its sister site <u>Clean Technica</u>) or the <u>MIT Technology Review</u>.

Books

- <u>Ehrlich, Paul</u>, 1968, <u>The Population Bomb</u>. Outdated assessment of <u>food shortage</u> fears. See also <u>Malthus</u>.
- Kaya, Yoichi; Yokoburi, Keiichi (1997). Environment, energy, and economy : strategies for sustainability. Tokyo [u.a.]: United Nations Univ. Press. ISBN 9280809113. This motivated the four factors described in the introduction.

ACADEMIC ARTICLES

- <u>Bradshaw, Corey, J.A.</u>, et al., 2020, <u>Underestimating the Challenges of Avoiding a Ghastly</u> <u>Future</u>, Frontiers in Conservation Science. This paper estimates that in 1960 humans took about 0.75 of what the planet could replenish. By 2016, it was 1.7, mostly due to our ballooning population.
- <u>Marchetti, C.</u>, 1993, <u>10¹2</u> A Check on Earth Carrying Capacity for Man, Global Bioethics, argued that the planet could conceivably sustain as many as 1 trillion people under an idealized reuse of resources 100 times as many as there are today. This was to push back on the Club of Rome, which had argued that civilization would soon collapse under the burden of too many people. We would not take eitherthe Club of Rome's pessimistic or Marchetti's optimistic estimates too seriously.

SHORTER NEWSPAPER, MAGAZINE ARTICLES, AND CLIPPINGS

- Spinney, Laura, 2021, Are there too many people? All bets are off, The Guardian.
- <u>Hodges, Glenn</u>, 2021, <u>Humans have 'stressed out' Earth far longer</u>, and more dramati-<u>cally</u>, than realized, National Geographic.

Websites

- https://www.eia.gov/outlooks/ieo/ is the main source of our information.
- https://ourworldindata.org/ curates important data used repeatedly throughout our book.
- https://www.iucn.org/, Union of Concerned Scientists.

Compiled: May 3, 2023