

Climate note #2: “The carbon budget”

Thomas Lord February 5, 2019, Berkeley, CA

In climate note #1, we noted this global consensus:

If humans are to avoid a massive die-off - and even steer well clear of possible human extinction - then within a single single human lifetime, net global carbon emissions from human activity must reach 0, and then go below 0.

To better understand what is required, scientists have asked this question:

How much CO₂ can we add to the atmosphere before we have locked in temperatures beyond our best-hope 1.5°C limit?

Today we are adding carbon to the atmosphere very quickly. Each year, human activity adds about 42 billion metric tonnes of CO₂ (aka “42 GtCO₂”) to the atmosphere.¹

The consensus understanding today is that we will have a slightly better than a 50-50 chance of staying below the 1.5°C limit if we add not more than an additional 580 GtCO₂. This is probably an optimistic estimate.

Let’s call that 580 GtCO₂ the human population’s remaining “carbon budget”.

If we continue to add CO₂ to the atmosphere at 42 GtCO₂ per year, we will use up the entire budget in 14 years. In 14 years or sooner, we will have locked in a much worse future.

The situation for the U.S. itself is only slightly less grim. The US emits roughly 15% of the world’s emissions. Our share of the carbon budget, 15% of 580, is 87 GtCO₂. U.S. emissions last year were 5.4 GtCO₂ - an increase from 2017. At a rate of 5.4 GtCO₂, the US will exhaust its carbon budget of 87 GtCO₂ in **16 years**.

How can we possibly make it 50 years before getting to 0? Well, by reducing our emissions this year, next year, and each year thereafter. How much decrease each year is needed?

Assuming emissions reductions go perfectly, everywhere in the world – the U.S. must reduce emissions by 6% per year, every year, starting this year.² To have any kind of safety margin, the rate should be higher - 15% or 20% is not unreasonable.

U.S. and California emissions both increased 2018.

¹The source for the numbers in this section is The *Intergovernmental Panel on Climate Change* Special Report 15 (“Climate Change of 1.5°C”), chapter 1 (“Summary for Policy Makers”), section C.1.3.

²To figure out how to stretch the carbon budget over 50 years, with a constant rate of emissions reduction, solve $\text{sum}(5.4 * x^n \text{ for } x \text{ from } 0 \text{ to } 49)$. x is about .94, meaning a minimum 6% reduction per year, every year, for 50 years.

About this series

This is the first in a series of very short discussions of climate change, meant to be easily understood by a wide audience.

Please let me know if you spot errors, or have suggestions or questions. I will do my best to improve the notes and to issue corrections as necessary. I can be contacted at lord@basiscraft.com. Please put "climate:" at the beginning of the subject line.

Planned topics

- **Climate note #1: "The push for zero"**
The *gravity* of the situation.
- **Climate note #2: "The carbon budget"**
The *scarcity* of resources to solve the problem.
- **Climate note #3: "How soon until zero?"**
The *urgency* of successful action.
- **Climate note #4: "Mass die-offs? Extinction? Really?!?"**
The *importance* of acting.
- **Climate note #5: "Your lifestyle or your life - physical and economic limits"**
The *sacrifice* required (no sugar-coating).
- **Climate note #6: "Can't we just make our infrastructure green?"**
The *denialism* popularized by progressive politics.
- **Climate note #7: "What is to be done?"**
How to act wisely, together, in *solidarity*.
- **Climate note #8: "The genocide problem."**
Are we *monsters*?
- **Climate note #9: "Simple plans of action."**
A little *courage* is all we need to act.
- **Climate note #10: "Rejoice."**
A personal reflection.