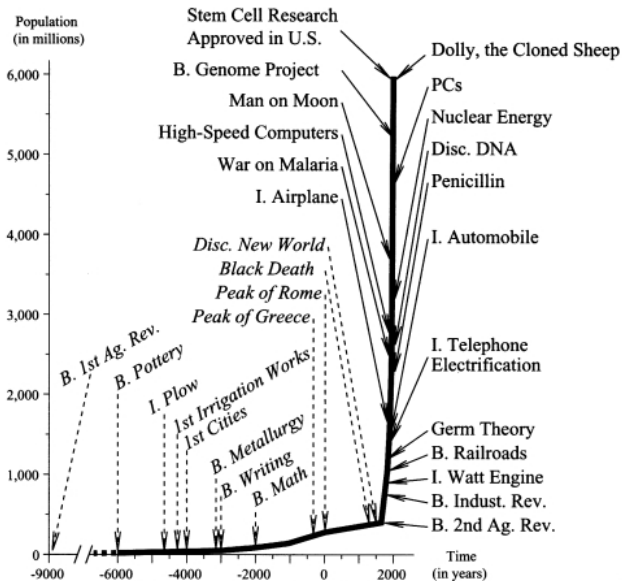
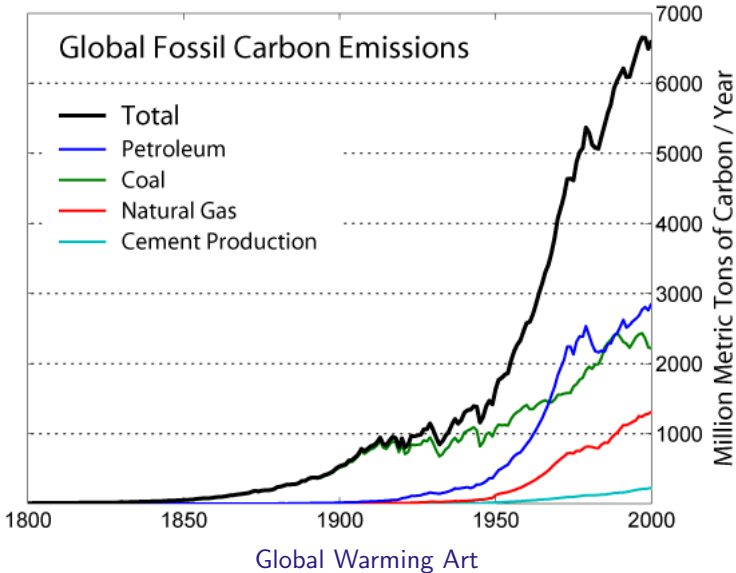


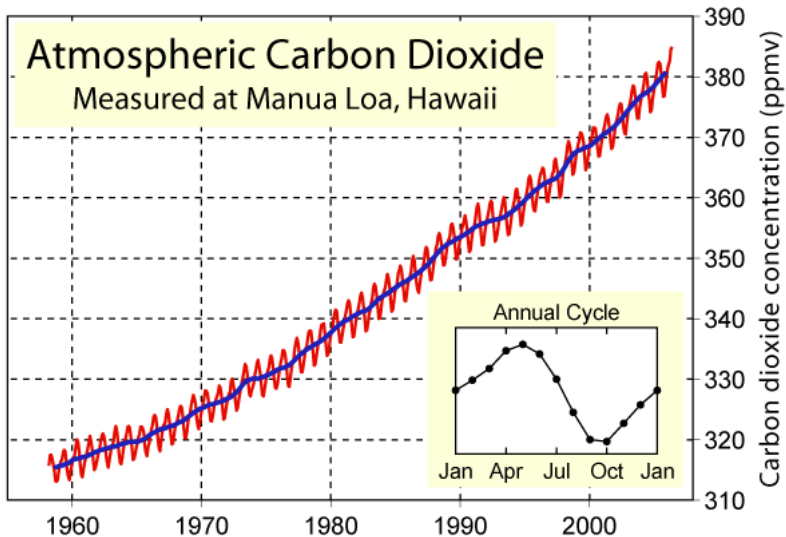
LEARNING TO LIVE ON A FINITE PLANET





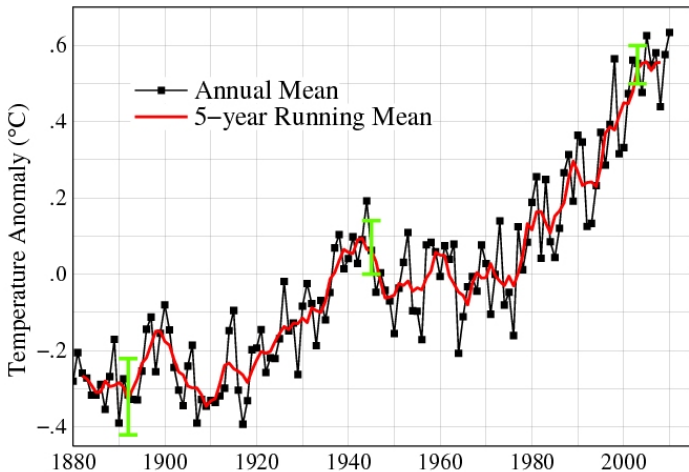
Robert Fogel - *The Escape from Hunger and Premature Death, 1700-2100*





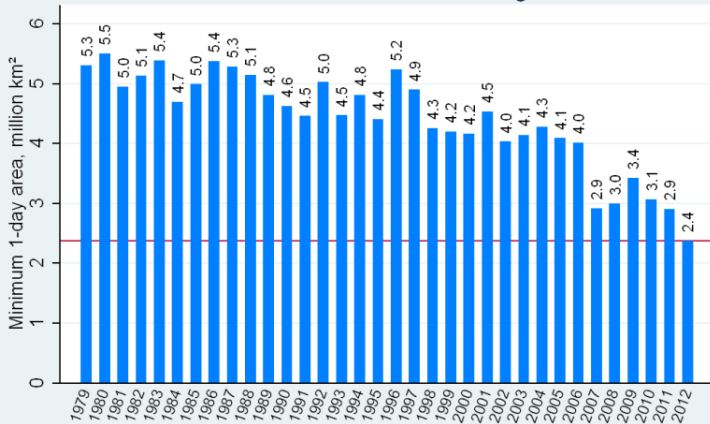
The Keeling Experiment — Global Warming Art

Global Land–Ocean Temperature Index



NASA Goddard Institute of Space Science

Minimum CT Arctic sea ice area through 9/2/2012

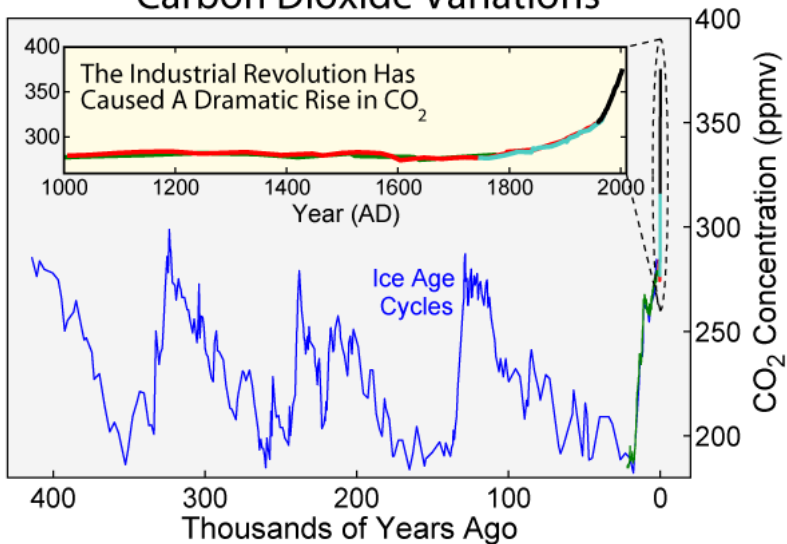


graph: L Hamilton

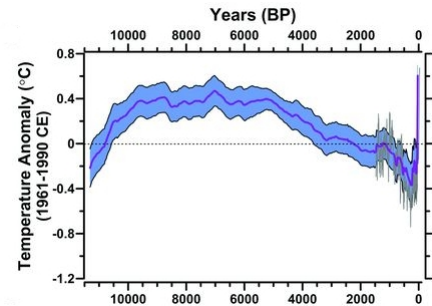
data: Cryosphere Today

The Cryosphere Today

Carbon Dioxide Variations



Antarctic ice cores and other data — Global Warming Art



Reconstruction of temperature from 73 different records — Marcott *et al.*

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The rate of extinction, already about 10 times its average level, will increase.

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Acting as if these are true inevitably brings us to a point where they *stop* being true.

So, we will come crashing into the brick wall of reality.

If we don't change our habits *before* things get significantly worse, we'll do so later. Either way, a transformation is inevitable.

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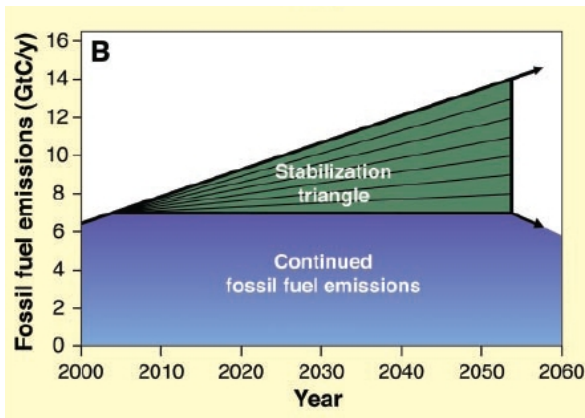
For better or worse, we *will* adapt to life on a finite-sized planet.

It's just a question of how.

What can we do? Slowing the rate of carbon burning is not enough: *most CO₂ stays in the air over a century*, though individual molecules come and go. We need to:

- ▶ leave fossil fuels unburnt,
- ▶ live with a hotter climate,
- ▶ sequester carbon, and/or
- ▶ actively cool the Earth.

In 2004, Pacala and Socolow looked for ways to hold carbon emissions constant until 2054 — *not a solution, just a start!*



They said it would require 7 'wedges'. Each wedge is a way to reduce carbon emissions by 1 gigatonne/year by 2054.

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Conservation/efficiency: Cut carbon emissions by 25% in buildings and appliances.

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And remember: *keeping emissions constant means warming will continue!* It's just a stopgap.

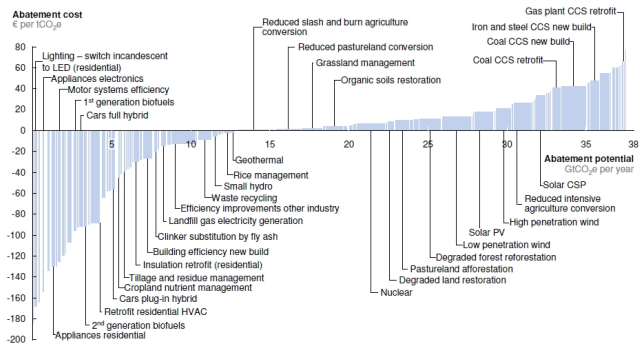
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Meinshausen estimates cutting current emissions in half by 2050 leaves a 12%–25% chance of a rise of 2°C or more.

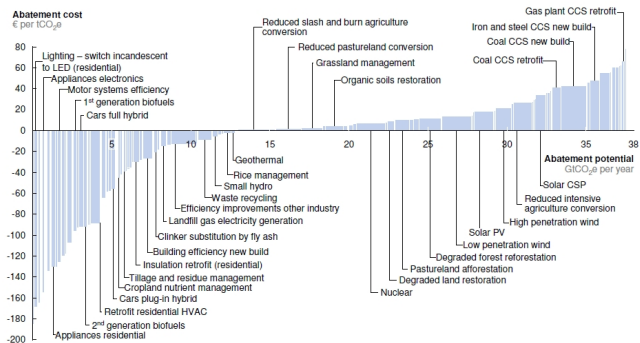
Some good news: **McKinsey & Co.** has argued that the world could cut carbon emissions by **10 gigatonnes per year** at roughly no net cost — all of Pacala and Socolow's wedges!

V2.1 Global GHG abatement cost curve beyond BAU – 2030



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V2.1 Global GHG abatement cost curve beyond BAU – 2030



But, this requires doing *many things*, *half of which cost money*.

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*No physical quantity can grow exponentially forever in a finite system. **We are living on a finite planet.***

We need to create an intelligent economic system, which recognizes this fact.

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- ▶ a matter economy to
- ▶ an energy economy to
- ▶ an information economy to
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LET'S GET STARTED!

Look up [Azimuth Project](#) for more.