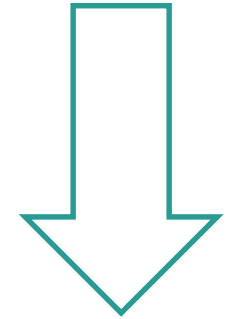


# Building a New Carbon Economy



March 29, 2018  
University of Michigan  
Noah Deich

[www.centerforcarbonremoval.org](http://www.centerforcarbonremoval.org)  
[@CarbonRemoval](https://twitter.com/CarbonRemoval)

1. Who is the **Center for Carbon Removal**?
2. What is the **“new carbon economy”**?
3. How do we **build** the new carbon economy?

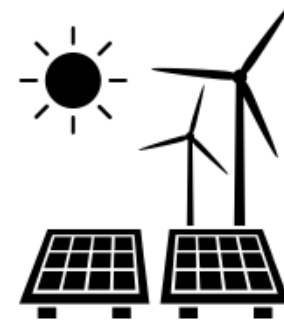
# If you take away three things...

1. To meet climate goals, we must *both eliminate* GHG emissions *and clean up* large volumes of carbon from the atmosphere.



# If you take away three things...

2. We can build a growing and prosperous economy that removes more carbon than it emits through a *portfolio of natural and technological carbon removal* approaches.



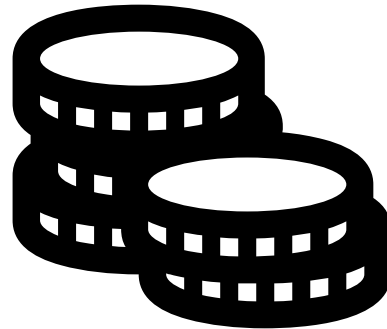
# If you take away three things...

3. With entrepreneurial spirit (and patience), you can find opportunities to build the new carbon economy *via policy, business, and/or research.*

*Policy*



*Business*

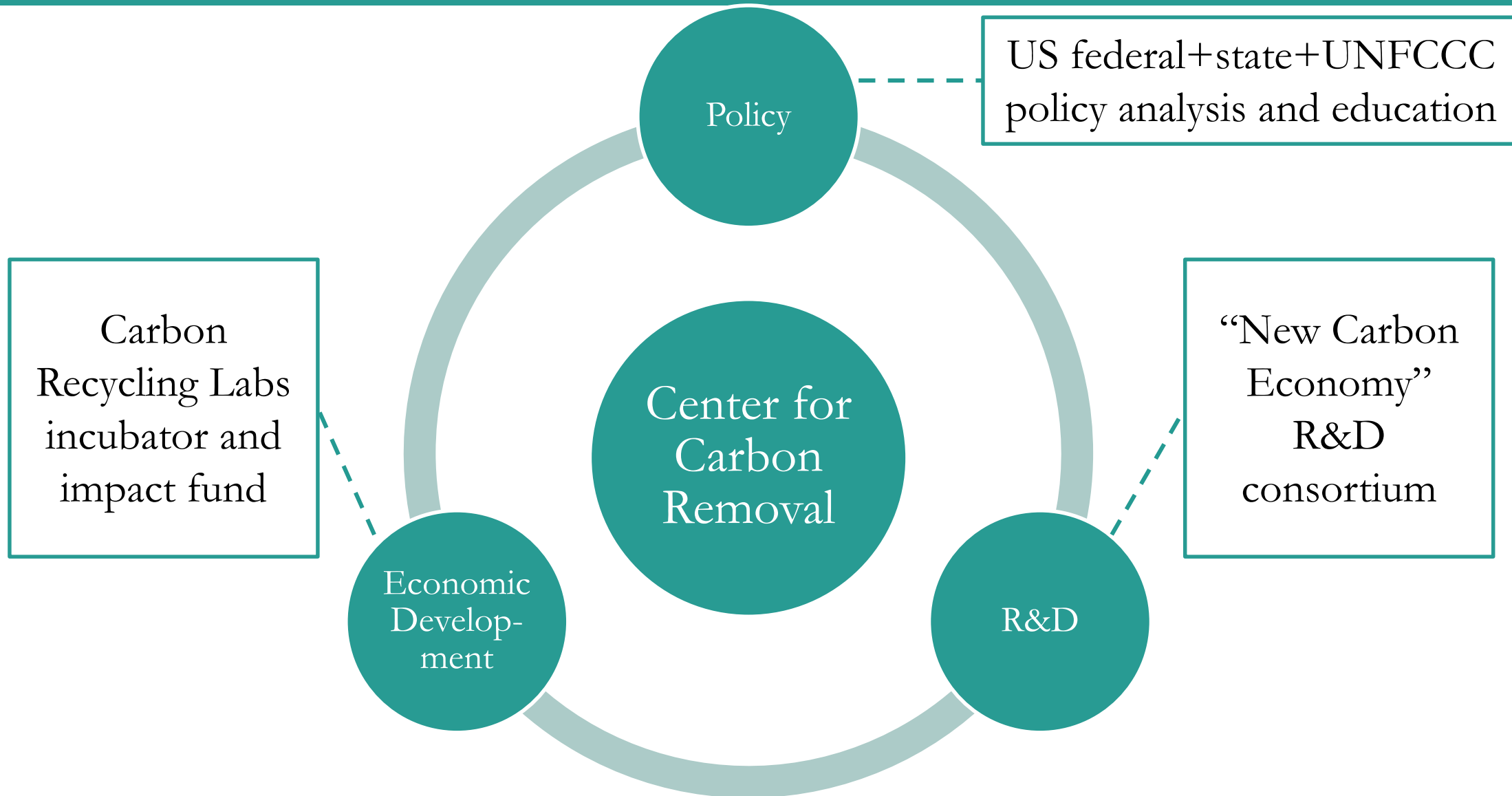


*Research*



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# Center for Carbon Removal: NGO on a mission to build a growing, prosperous economy that sequesters more carbon than it emits.



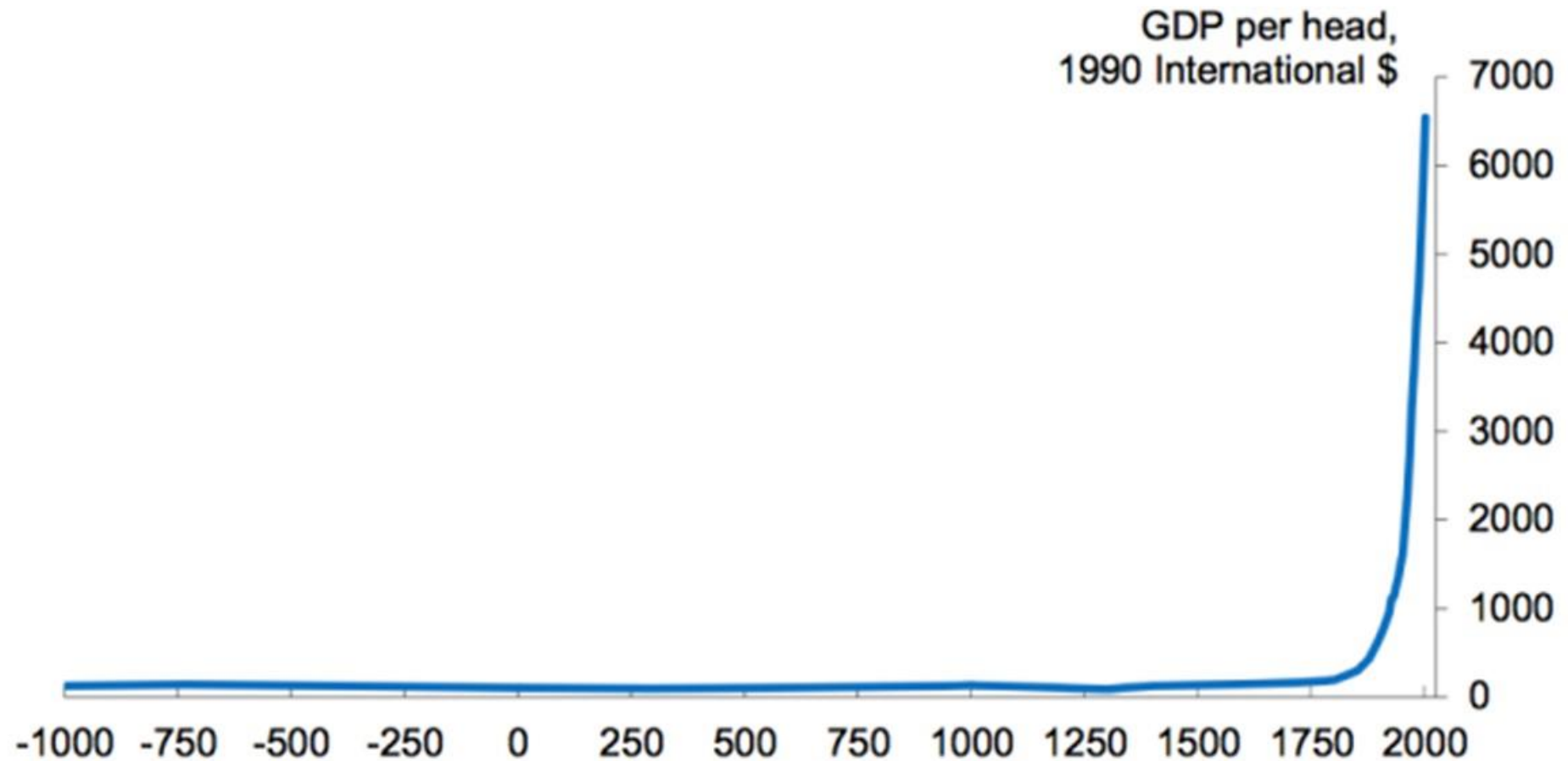
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# What is the “old carbon economy”?

## Massive economic growth post-industrial revolution...

**Chart 2: GDP per capita since 1000 BC**

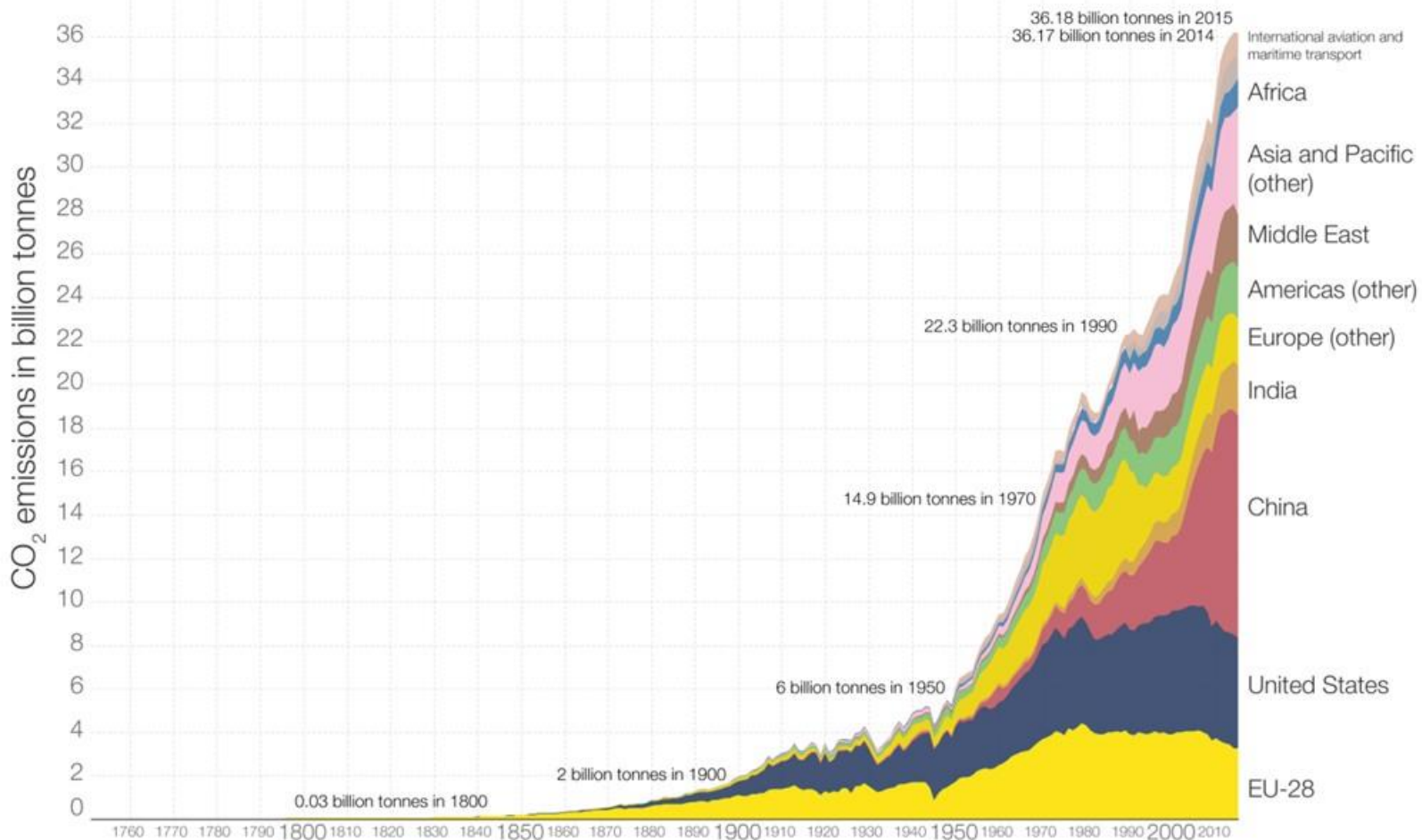


Source: DeLong (1998).

...coupled with massive growth in CO<sub>2</sub> emissions.

## Global CO<sub>2</sub> emissions by world region, 1751 to 2015

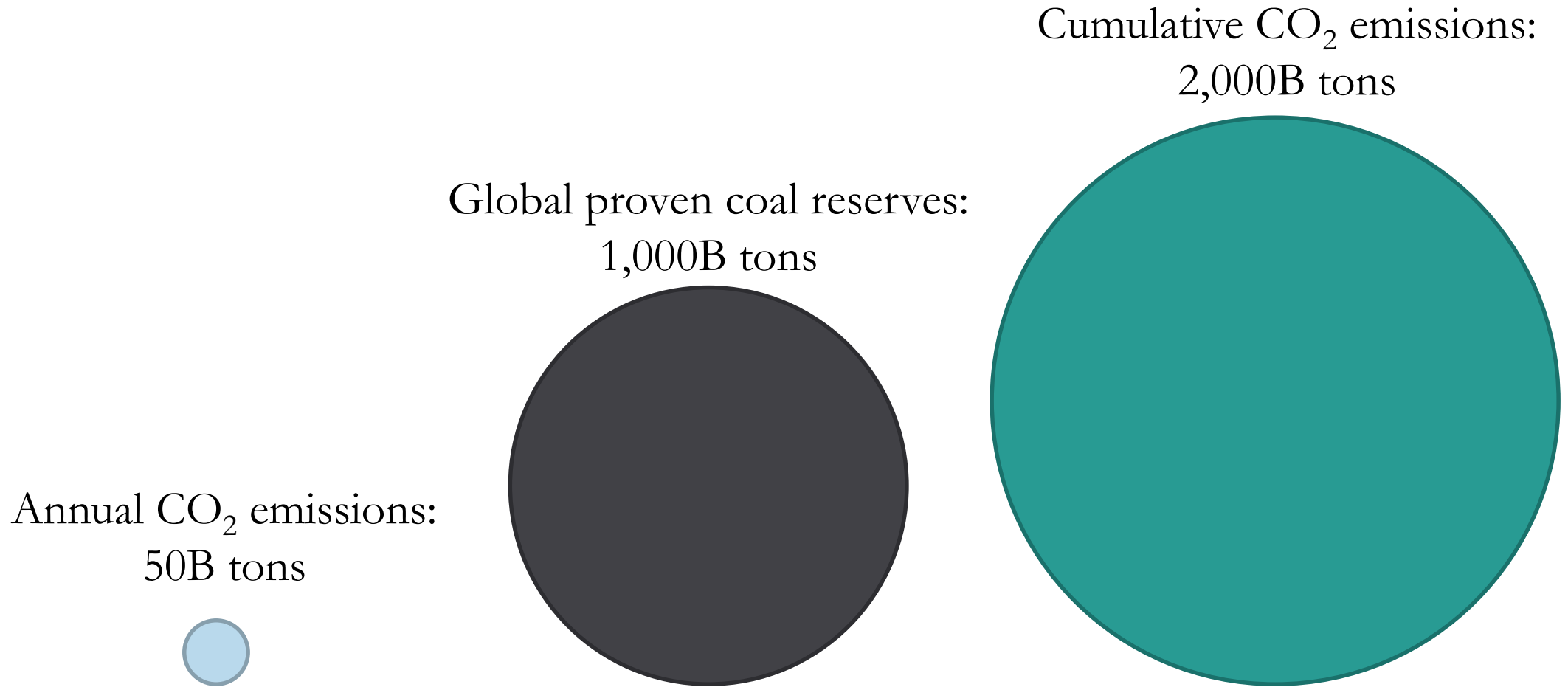
Annual carbon dioxide emissions in billion tonnes (Gt).



Data source: Carbon Dioxide Information Analysis Center (CDIAC); aggregation by world region by Our World In Data. The interactive data visualization is available at [OurWorldinData.org](http://OurWorldinData.org). There you find the raw data and more visualizations on this topic.

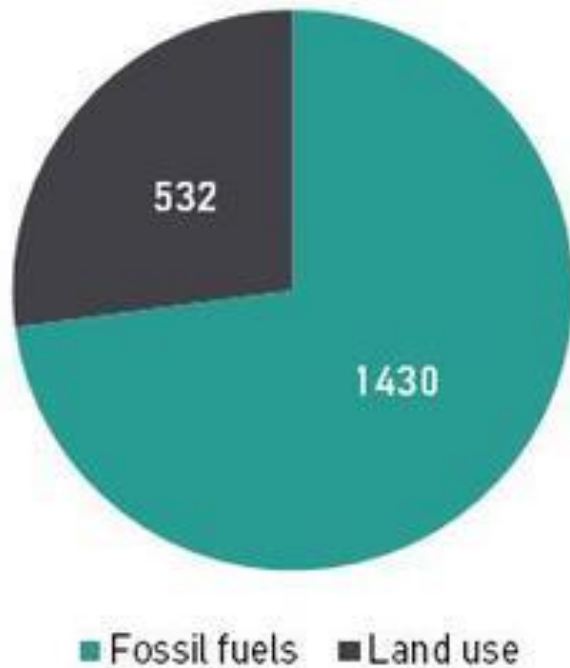
Licensed under CC-BY-SA.

# The “old carbon economy” has produced a massive amount of cumulative CO<sub>2</sub> emissions...

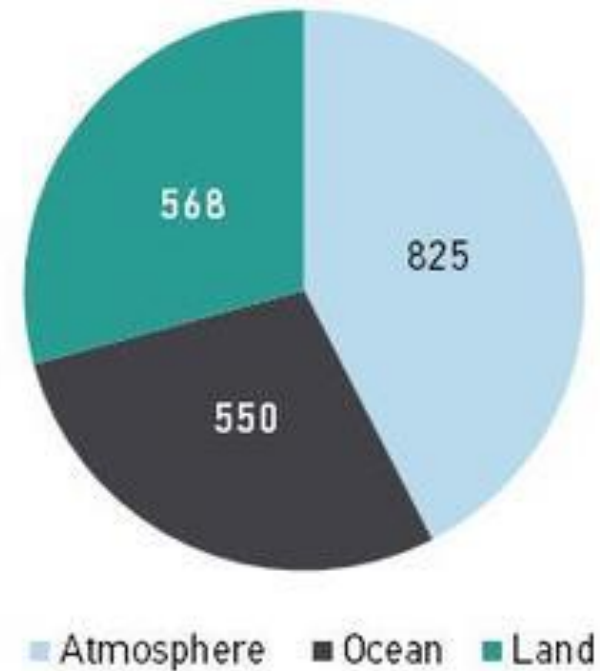


...which is a problem because much of that CO<sub>2</sub> has ended up in the atmosphere, where it will remain naturally for centuries.

### Sources of CO<sub>2</sub> Emissions

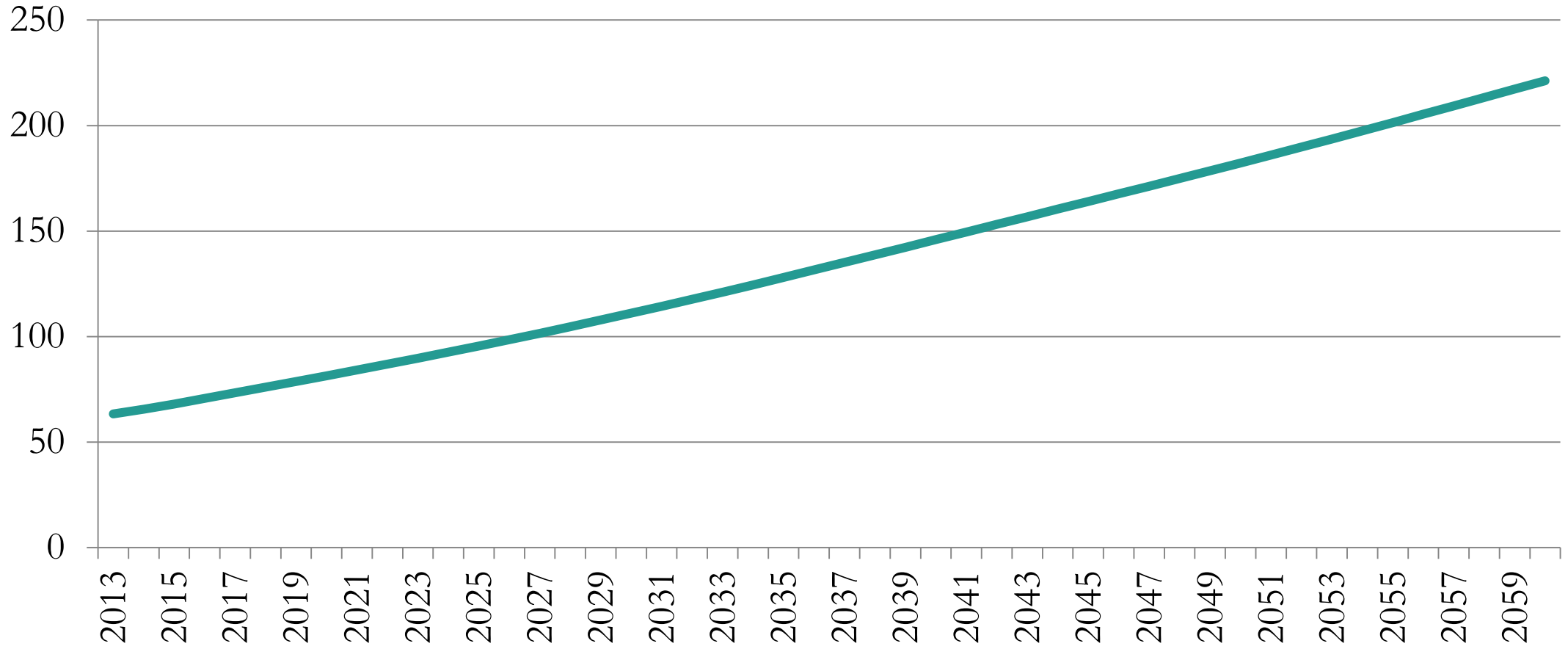


### Ending CO<sub>2</sub> Sink

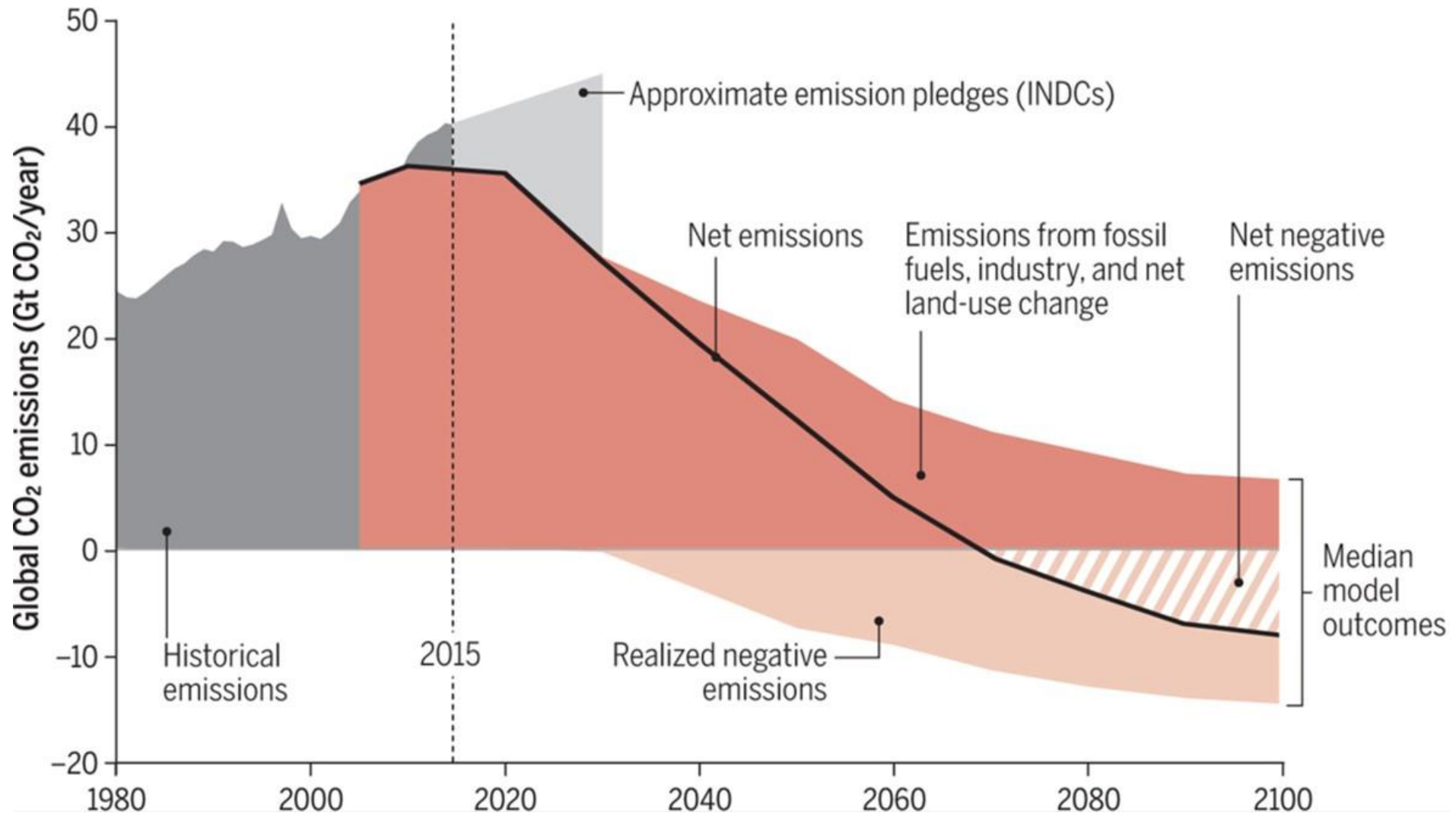


To solve these problems, we need a “new carbon economy” that continues to grow...

## OECD's Long Range Global GDP Forecast



...while fundamentally *reversing* the relationship between economic growth and CO<sub>2</sub> emissions.

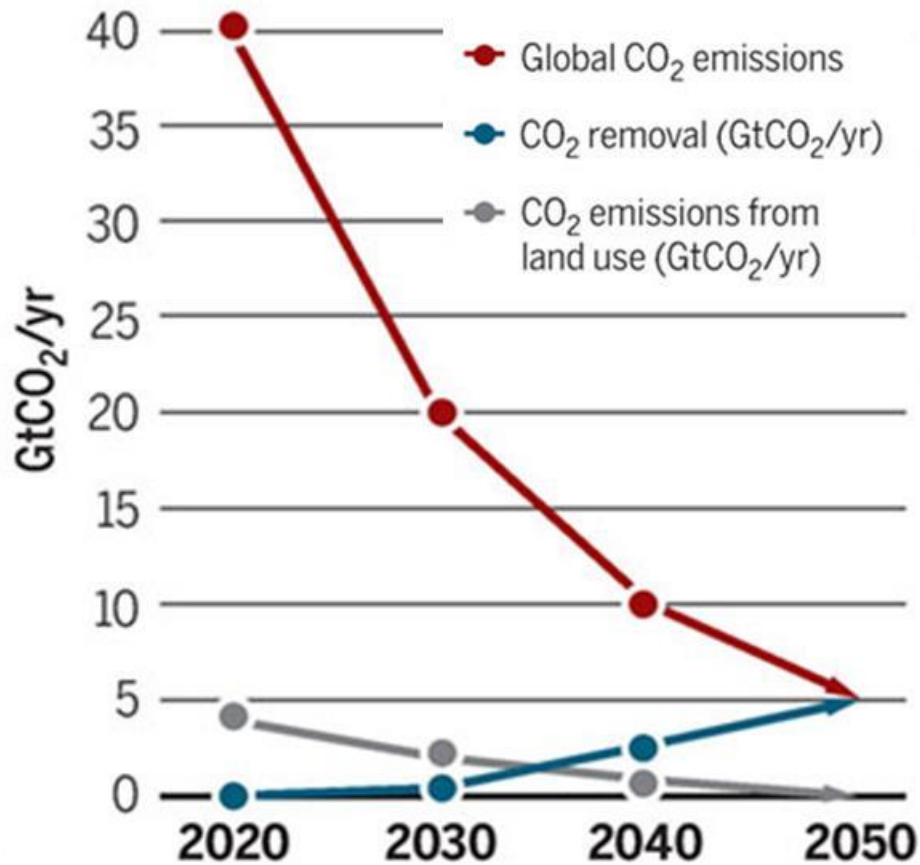


Source: Glen Peters and Kevin Anderson in Nature Climate Change

Center for Carbon Removal // [www.centerforcarbonremoval.org](http://www.centerforcarbonremoval.org) // @CarbonRemoval

# Building a new carbon economy is essential, possible, and will prove very challenging

Global carbon law guiding decadal pathways



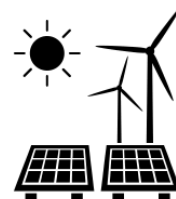
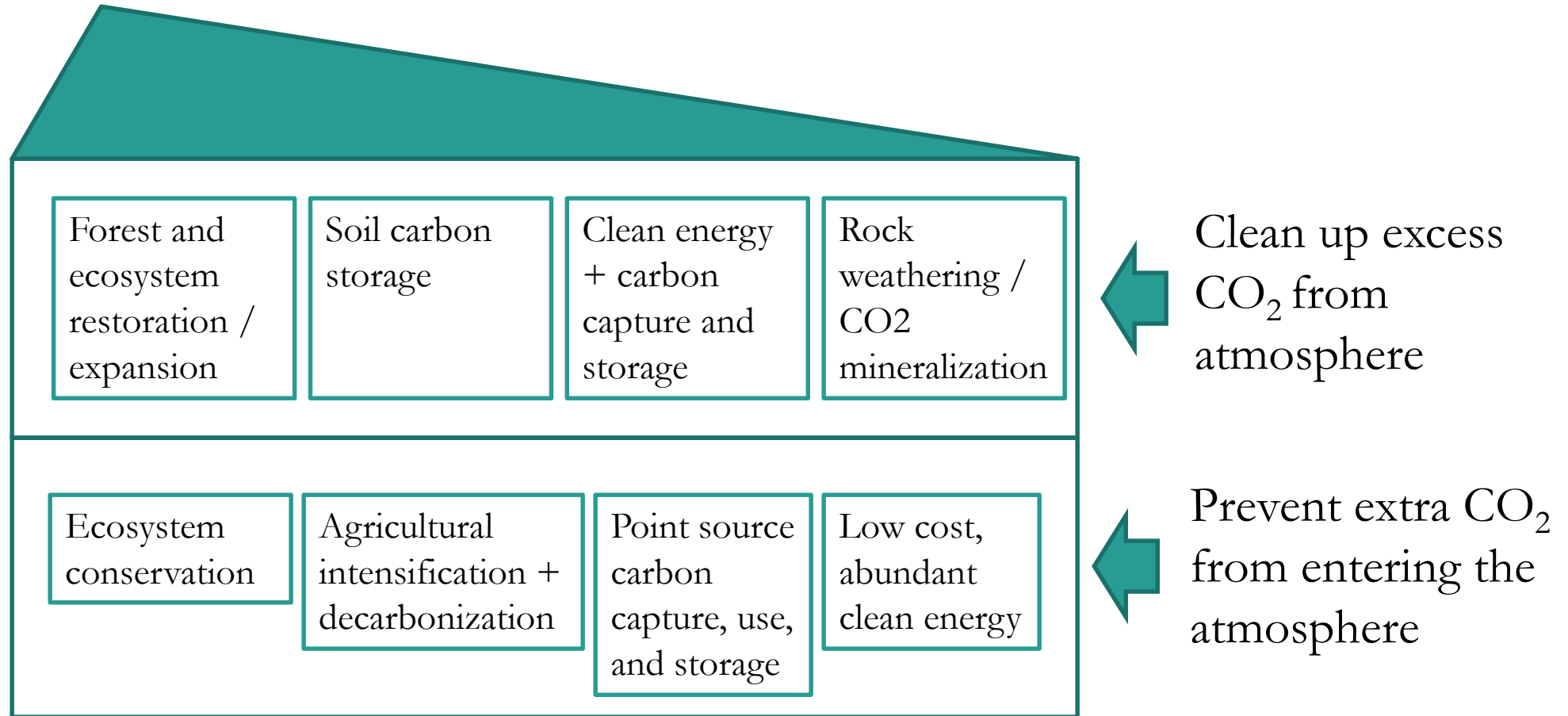
1. Deeply decarbonize

2. Eliminate land use emissions

3. Scale carbon removal

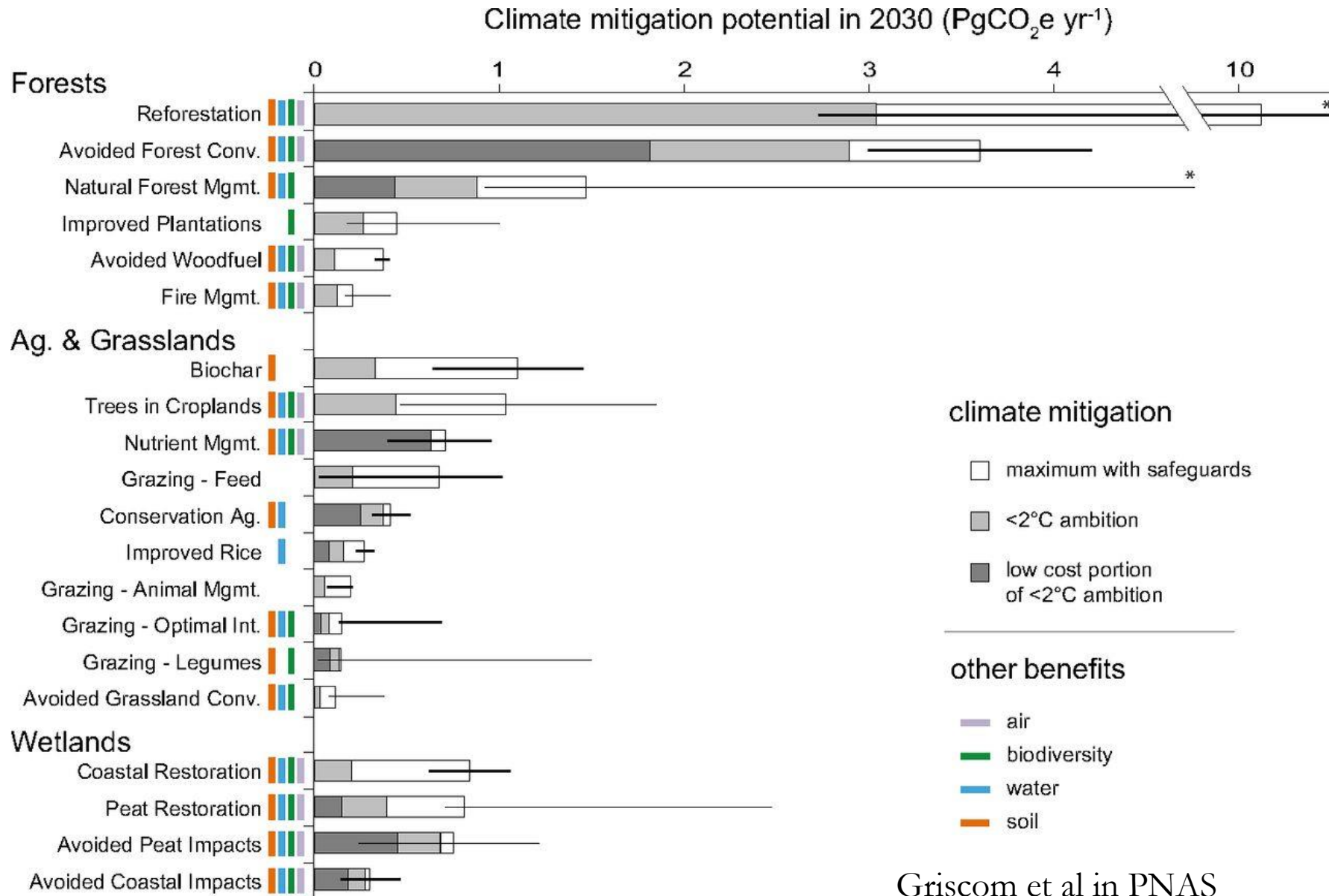
Source: Rockstrom et. al in Science

# The solution “layer cake” for a new carbon economy:

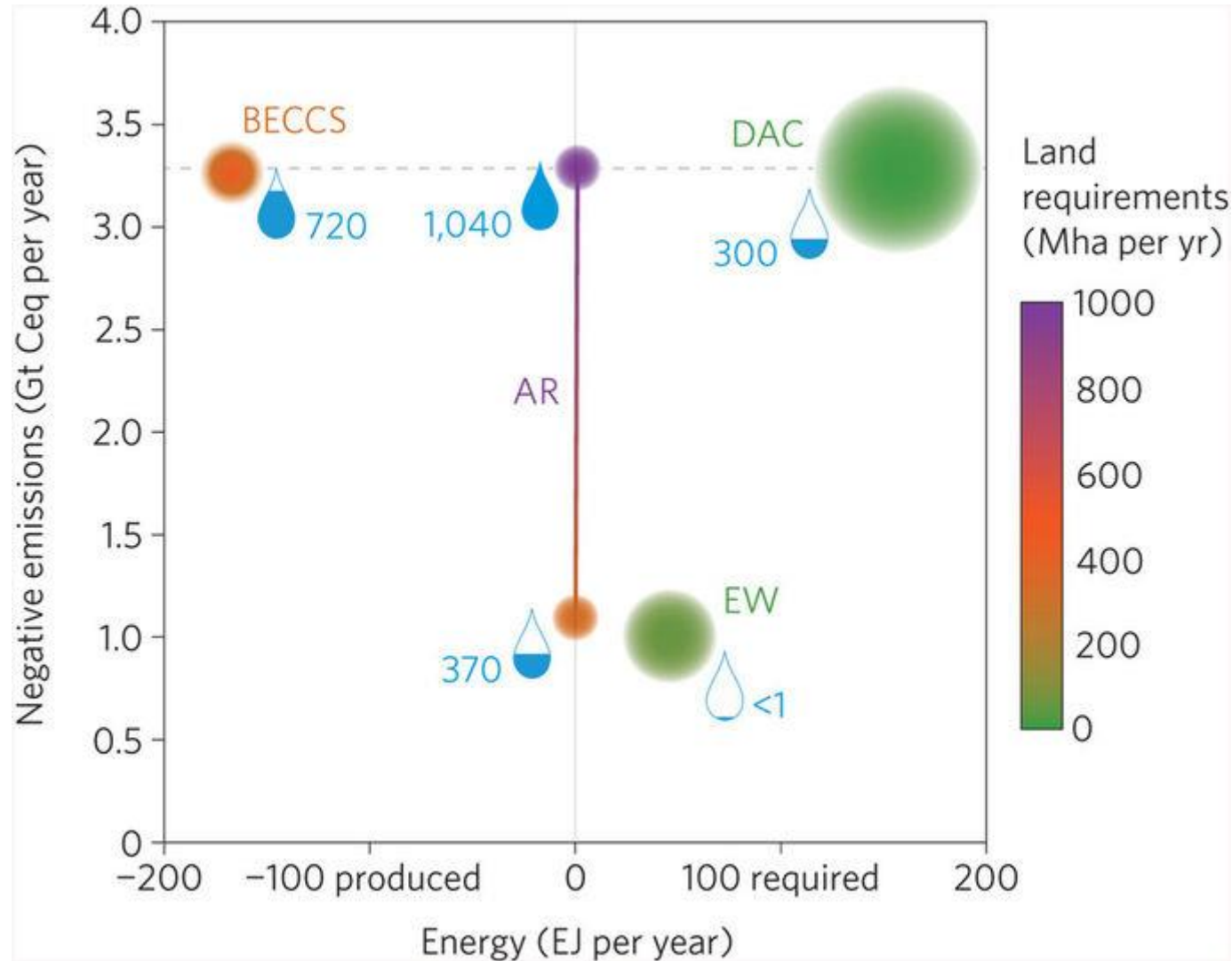




# Natural solutions: dozens of options, mostly forests, half sequestration.



# Technological approaches: big potential, big challenges, early days



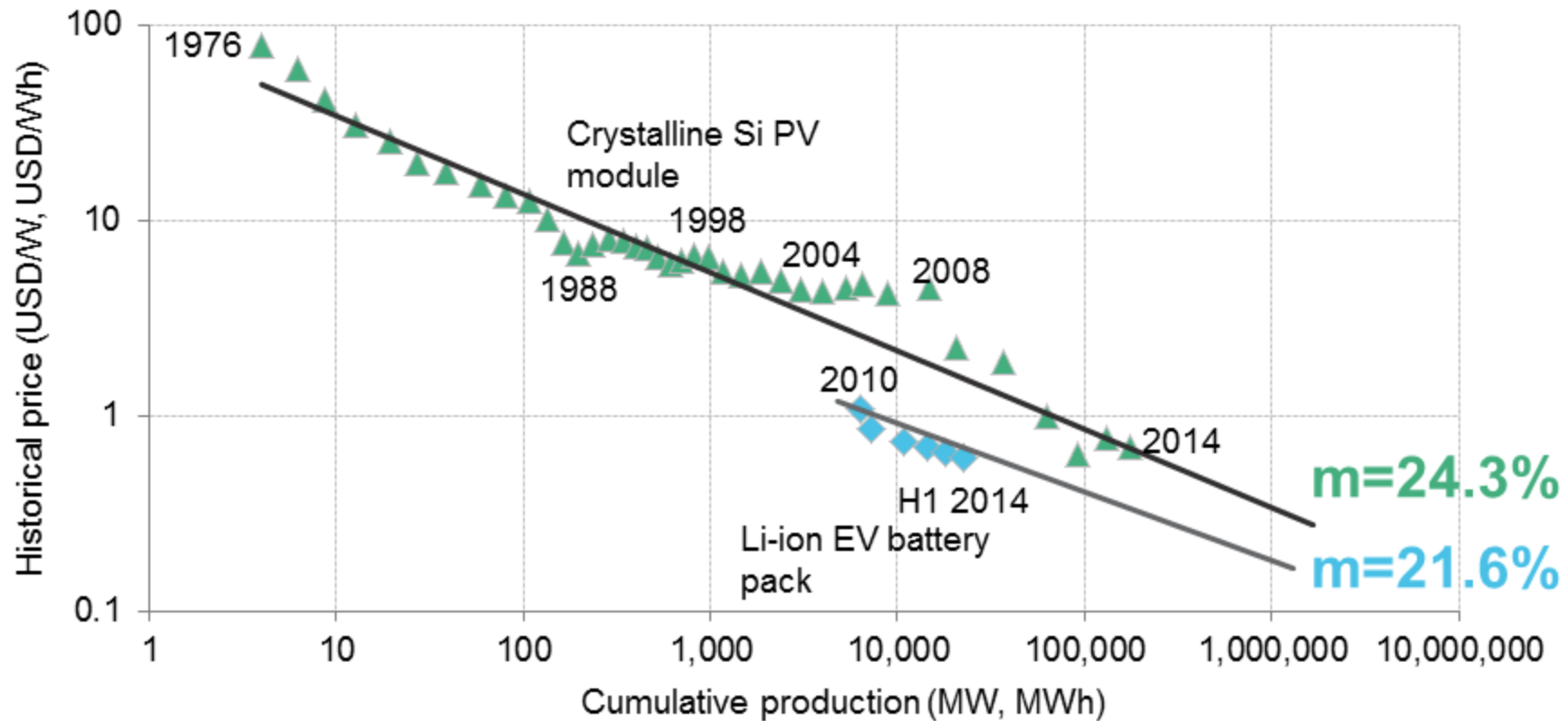
Pete Smith in Nature Climate Change

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We know there is a learning curve, we just don't know the slope...

## LITHIUM-ION EV BATTERY EXPERIENCE CURVE COMPARED WITH SOLAR PV EXPERIENCE CURVE

Bloomberg  
NEW ENERGY FINANCE



Note: Prices are in real (2014) USD.

Source: Bloomberg New Energy Finance, Maycock, Battery University, MIT

Michael Liebreich, New York, 14 April 2015

@MLiebreich

#BNEFSummit

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# Technological approaches



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# Policy overview: patchwork of policies exists today, but needs major expansion to achieve goals

International	US Federal	US state
<ul style="list-style-type: none"><li>• Paris Agreement: pledges fall short of “well below” 2C</li><li>• UK: ~\$10M R&amp;D program for “GGR”</li><li>• EU: Considering ~\$10M R&amp;D program in 2020 timeframe</li></ul>	<ul style="list-style-type: none"><li>• 45Q tax credits for carbon capture, use, and storage (\$35-50/t CO<sub>2</sub> sequestered)</li><li>• USDA soil health and forest restoration programs</li></ul>	<ul style="list-style-type: none"><li>• CA Low Carbon Fuel Standard (~\$150/t CO<sub>2</sub>)</li><li>• “Healthy Soils” programs and natural and working lands baselines</li></ul>

# Business overview: corporates just beginning to incorporate a new carbon economy into their future

“Carbon tech”	Regenerative Ag	Sustainable wood products
<ul style="list-style-type: none"><li>Transforming waste carbon into value in building materials, fuels, consumer goods</li></ul>	<ul style="list-style-type: none"><li>Annie’s, Patagonia, Ben and Jerry’s among leaders making supply chain commitments</li></ul>	<ul style="list-style-type: none"><li>Increase in cross-laminated timber for built environment</li></ul>

## Watch this space:

- *IPCC – 1.5C Special Report*: (Q3 2018) highlights essential role for deep decarbonization + carbon removal for meeting aggressive climate targets
- *National Academies – Carbon Removal R&D Roadmap*: (Q3 2018) informs funding needs and priorities for Congress
- *New Carbon Economy Consortium – R&D Roadmap*: (Q2 2018) informs university research agenda



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Thank you!

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# New Carbon Economy Building Blocks

