Engineering an Anthropogenic *Azolla* Event

Technologies and strategies to enable large-scale carbon removal and management

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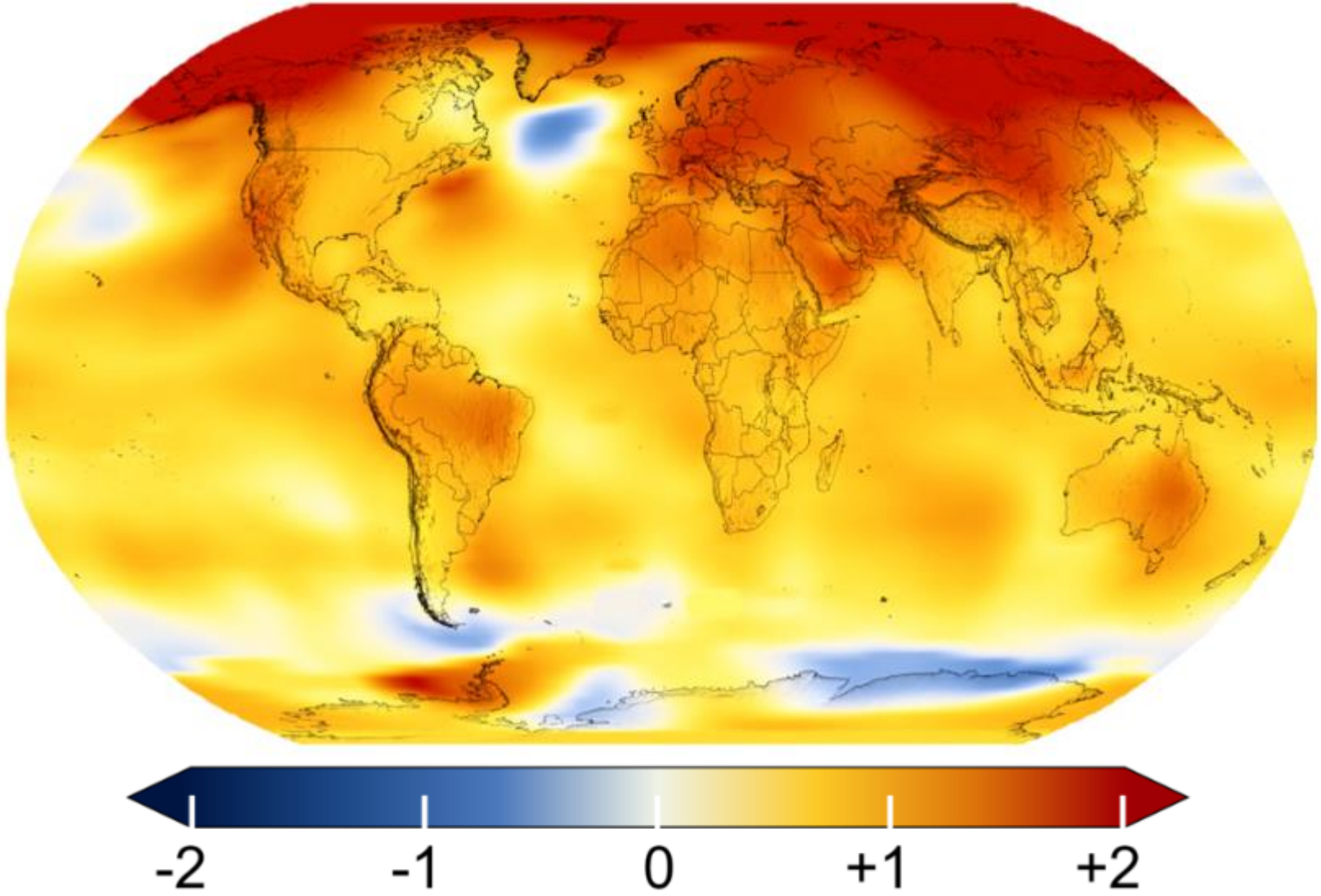
Earth has a fever

Surface temperature anomalies 2014-2018 as compared to 1951-1980 baseline



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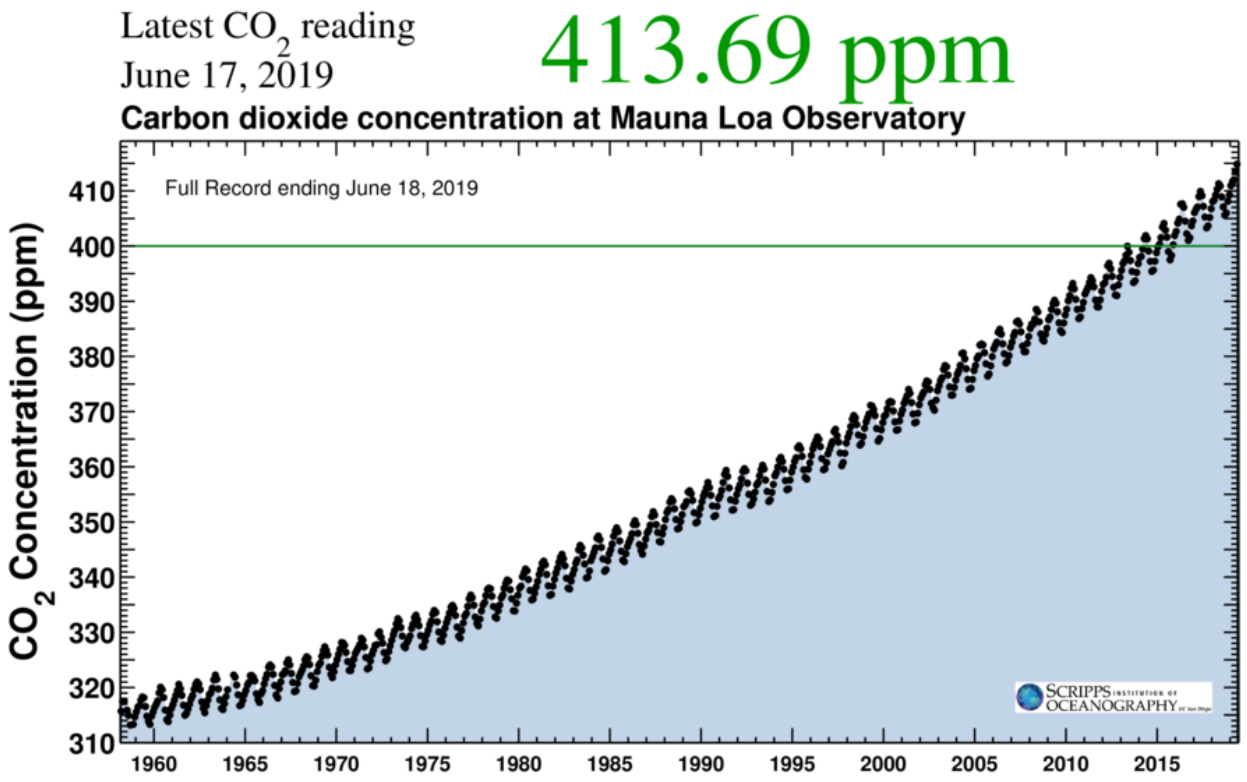
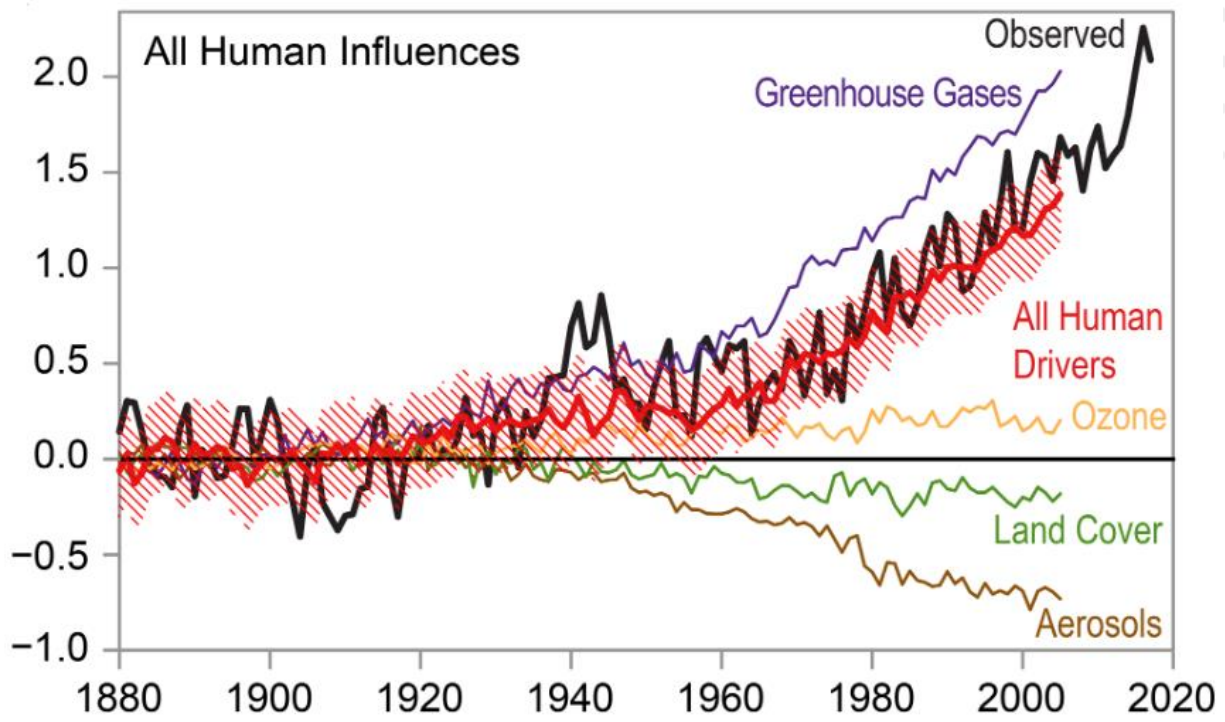
CHANGING WHAT'S POSSIBLE

We know what is causing it, and how to cure it



The Keeling Curve



Temperature correlation to human influences

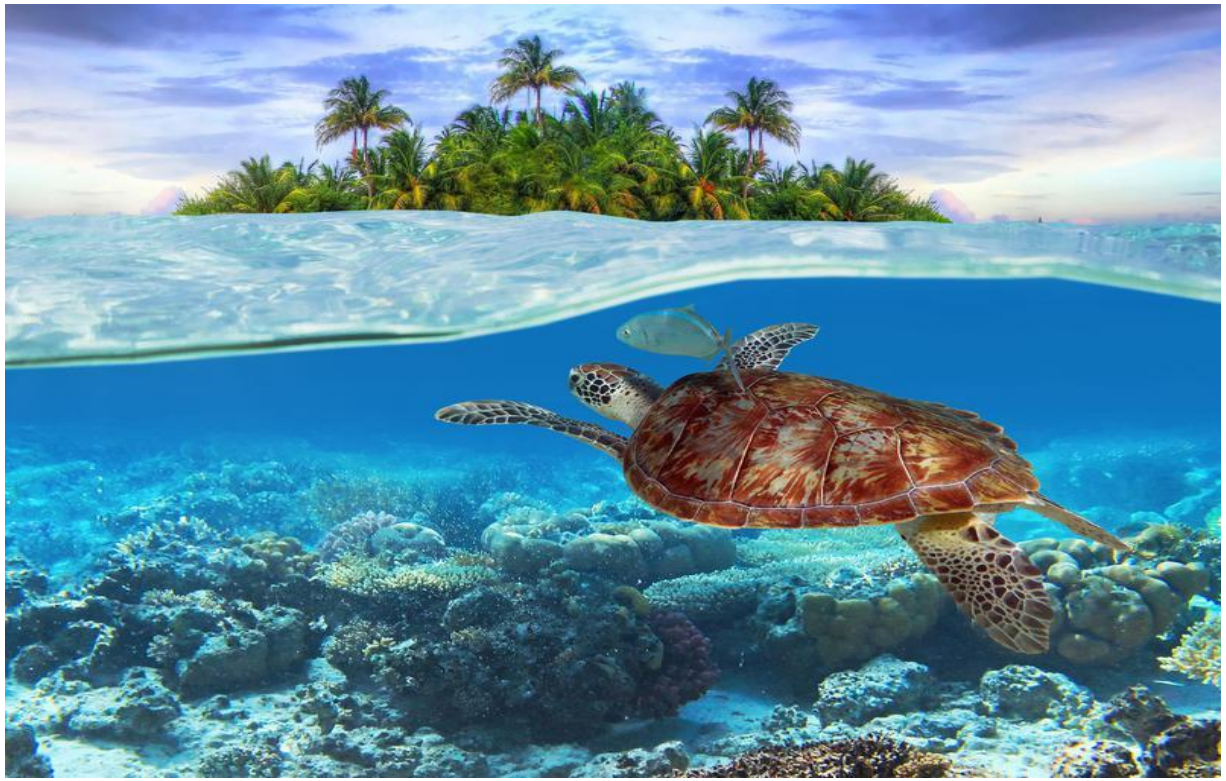
The *Hothouse Earth*

Hothouse Earth Conditions

49 Million Years Ago

[CO_2] = 3,500 ppm

Arctic sea surface temperature = 13^0 C



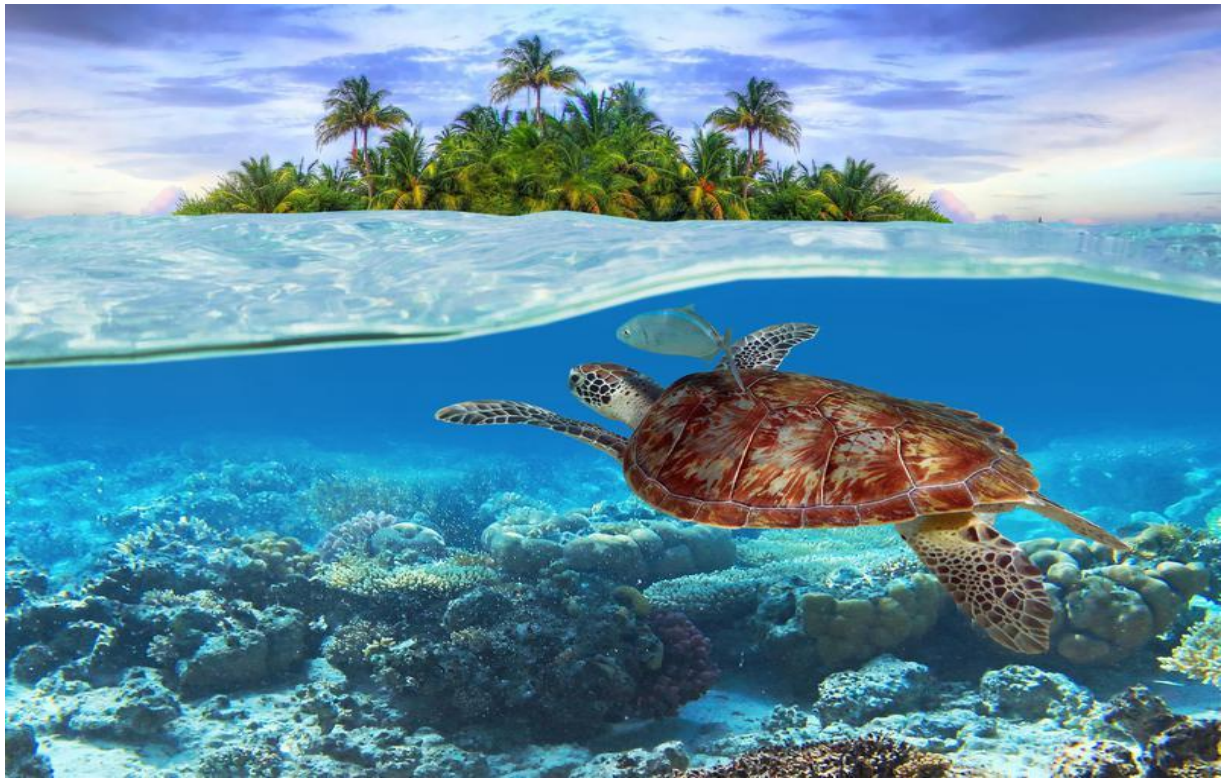
The *Azolla* Event – An example to consider

Hot House Earth Conditions

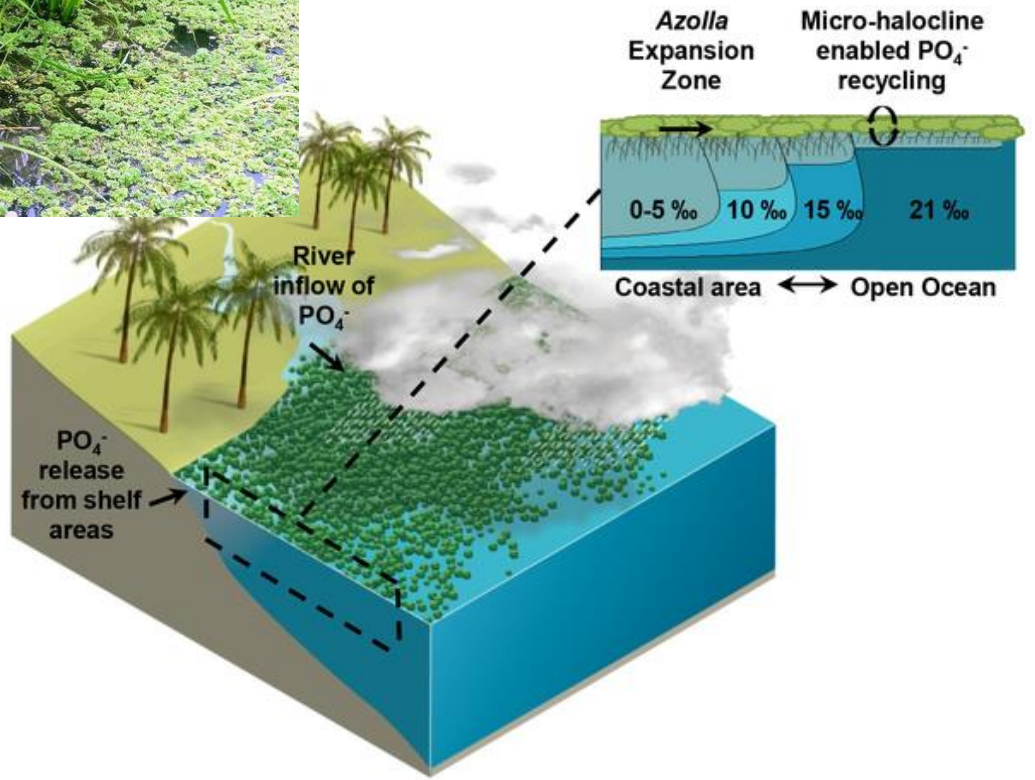
Before *Azolla Event* 49 Million Years Ago

[CO_2] = 3,500 ppm

Arctic sea surface temperature = 13^0 C



The Azolla Event



The *Azolla* Event – An example to consider

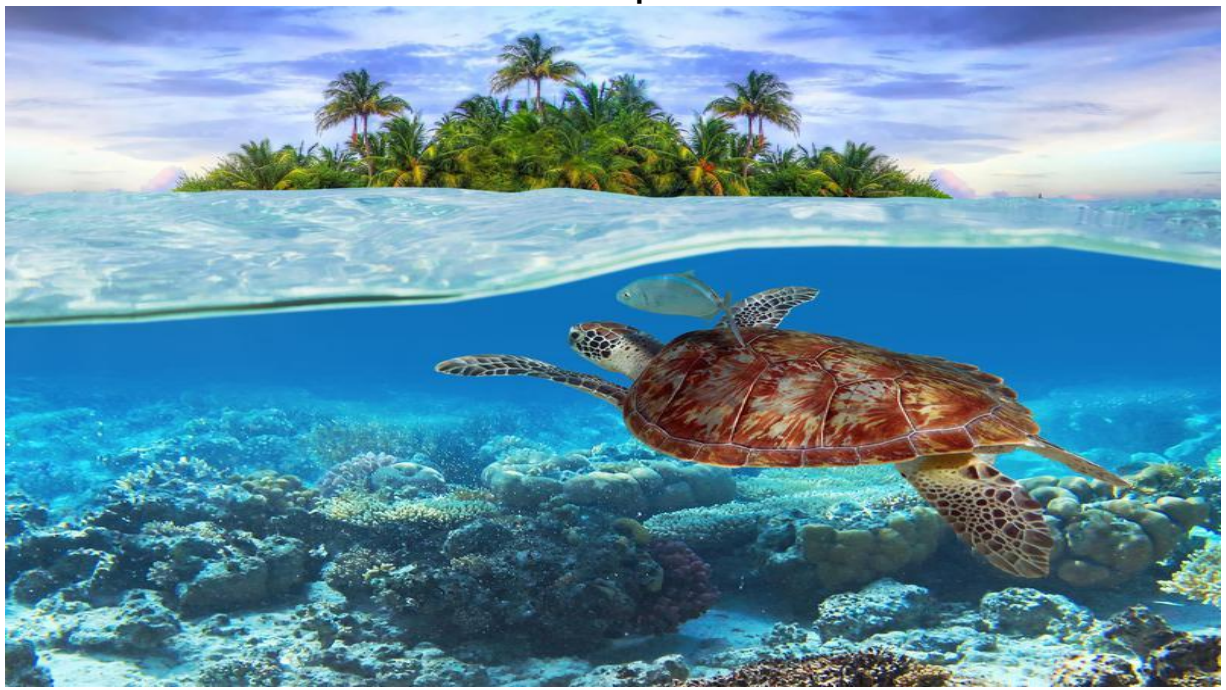
800,000 years

Hot House Earth Conditions

Before *Azolla Event* 49 Million Years Ago

[CO_2] = 3,500 ppm

Arctic sea surface temperature = 13^0 C



Ice House Earth Conditions

After *Azolla Event*

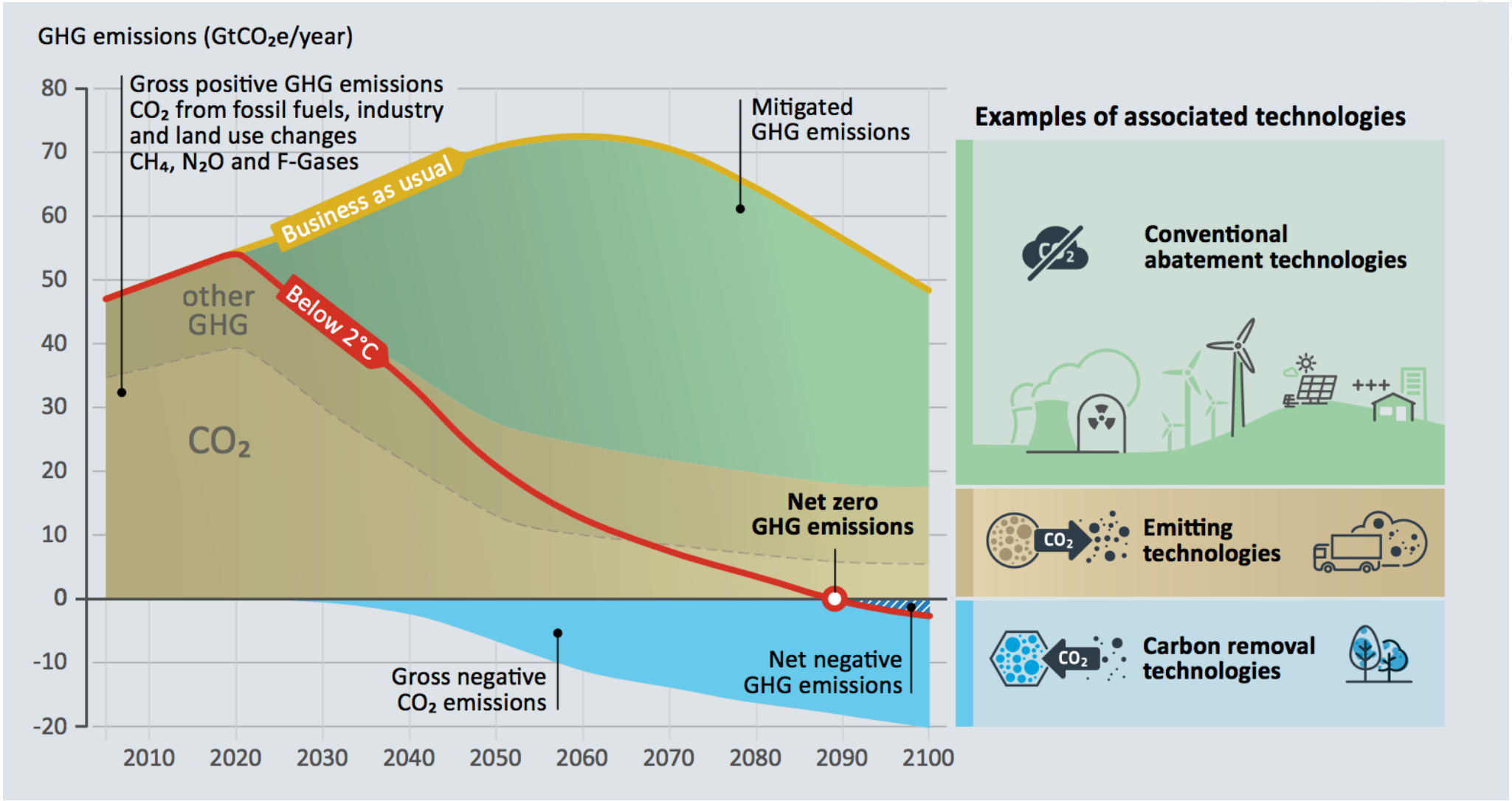
[CO_2] = 650 ppm

Today

[CO_2] = > 400 ppm

ASST = -9^0 C

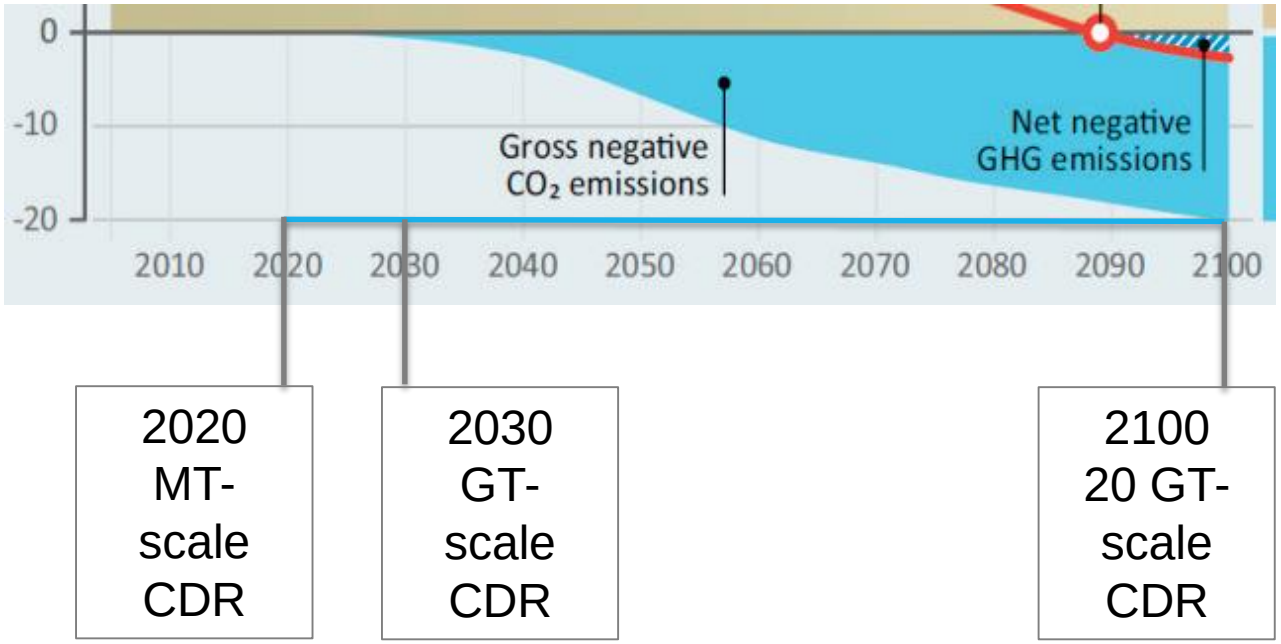
There is a treatment path for the current fever



National Academy of Sciences. *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda.* 2019. p. 3

An Anthropogenic '*Azolla*' Event

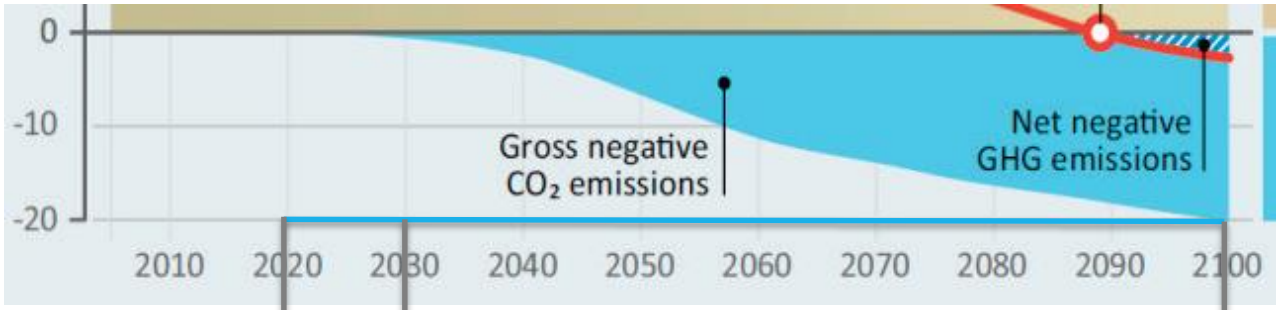
Carbon Removal Capacity



CDR = carbon dioxide removal

An Anthropogenic '*Azolla*' Event – it would be BIG

Carbon Removal Capacity



2020 MT-scale CDR

2030 GT-scale CDR

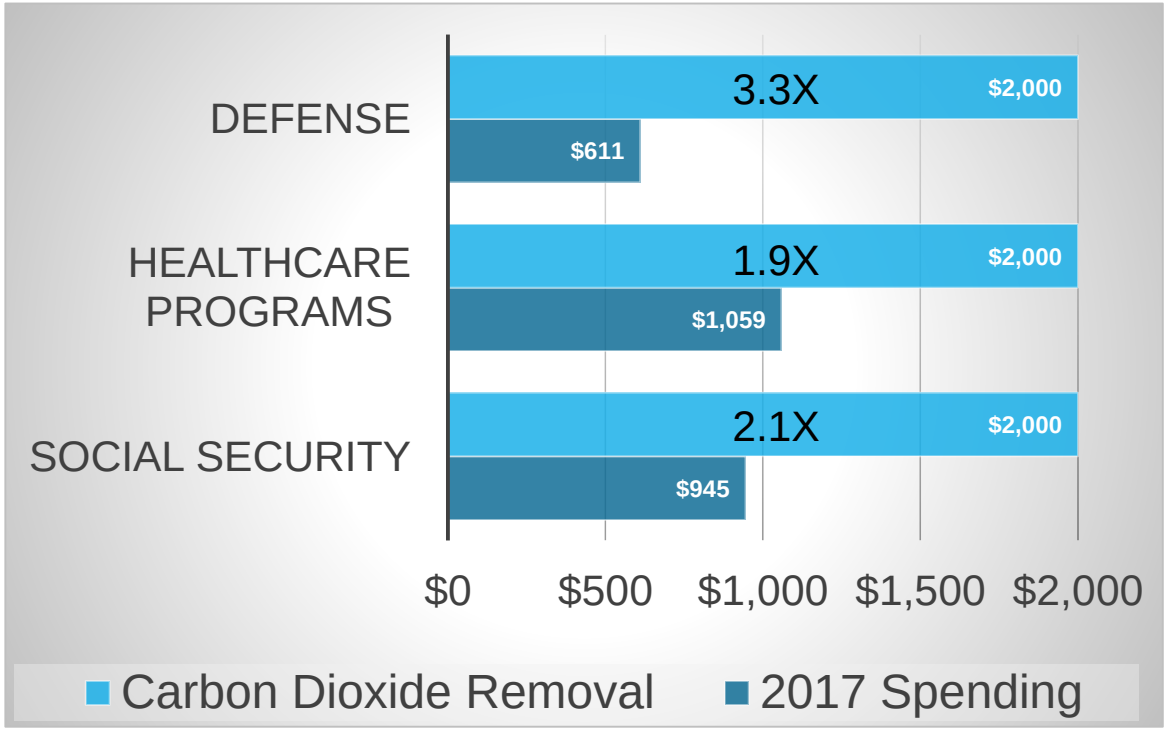
2100 20 GT-scale CDR

CDR = carbon dioxide removal

Comparison to Federal Spending

Assuming $100 per tonne of CO_2 for removal.

Amounts in billions of US dollars



Biological Solutions

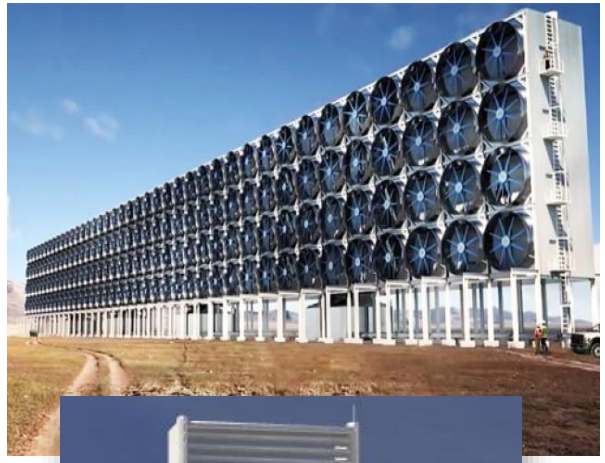
Coastal Blue Carbon and Aquatic Systems

Forest and Land Management

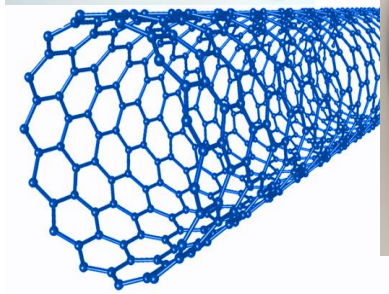
Soil Carbon Sequestration

Soil Amendments & Nutrient Management

Engineered Solutions



Direct Air Capture



Conversion and Use

Enhanced Weathering and Mineralization

Hybrid Solutions

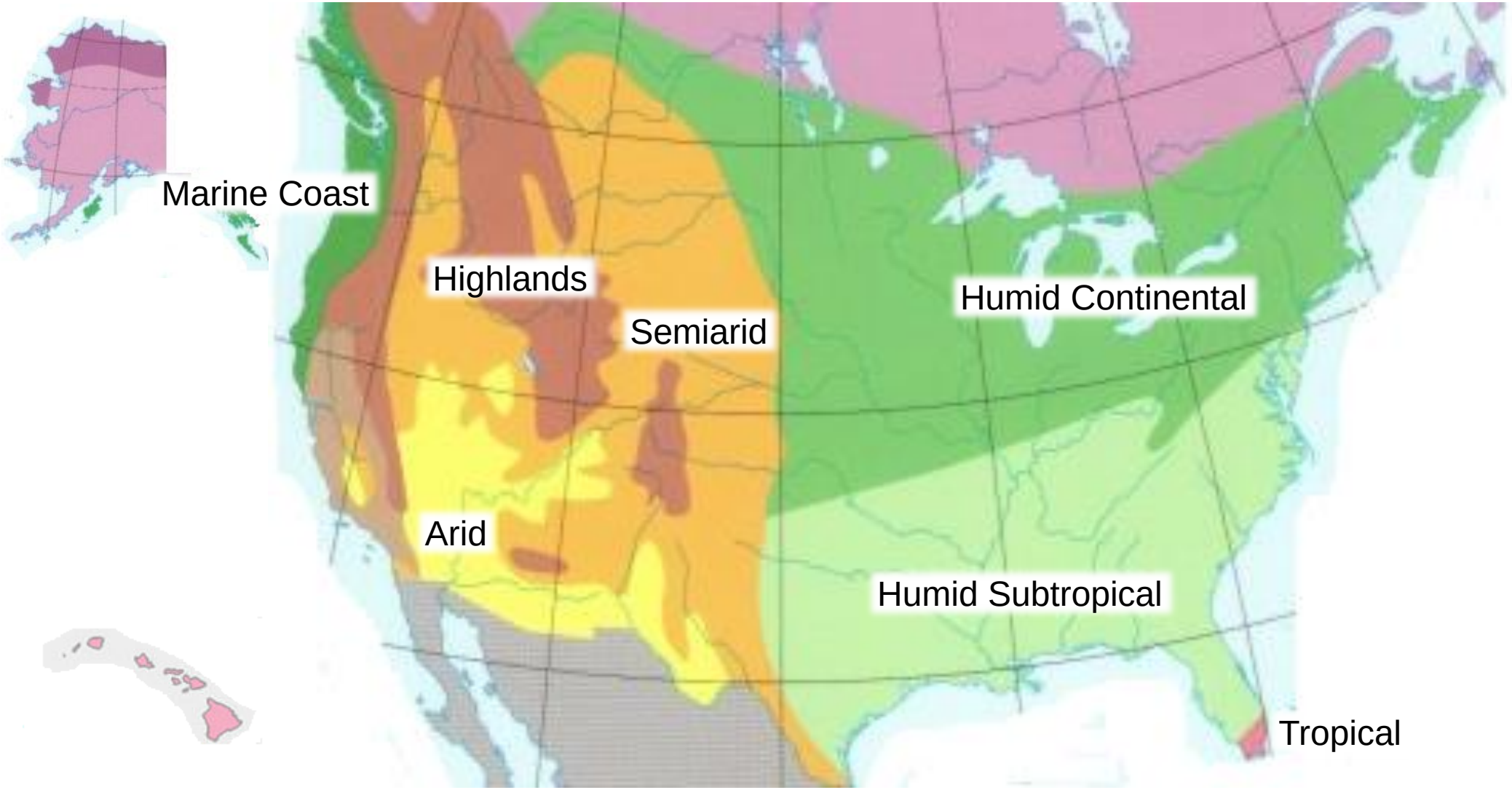
Bioenergy with carbon capture and storage

BECCS

Construction and Buildings

Biochar

Diverse climate zones accommodate a diverse economy



CDR – diverse and broadly distributed industry

Thank you!

Innovations to enable:

- energy efficient
- low cost
- widely scalable
- rapidly deployable

carbon dioxide removal and stabilization.

We want your input!

David Babson

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