

Private Financing of Climate Solutions?

Galina Hale

UC Santa Cruz, NBER, CEPR

Keynote prepared for EMG-ECB Workshop Emerging Markets Group Workshop on The Open Economy of Climate Change, London, September 15, 2023

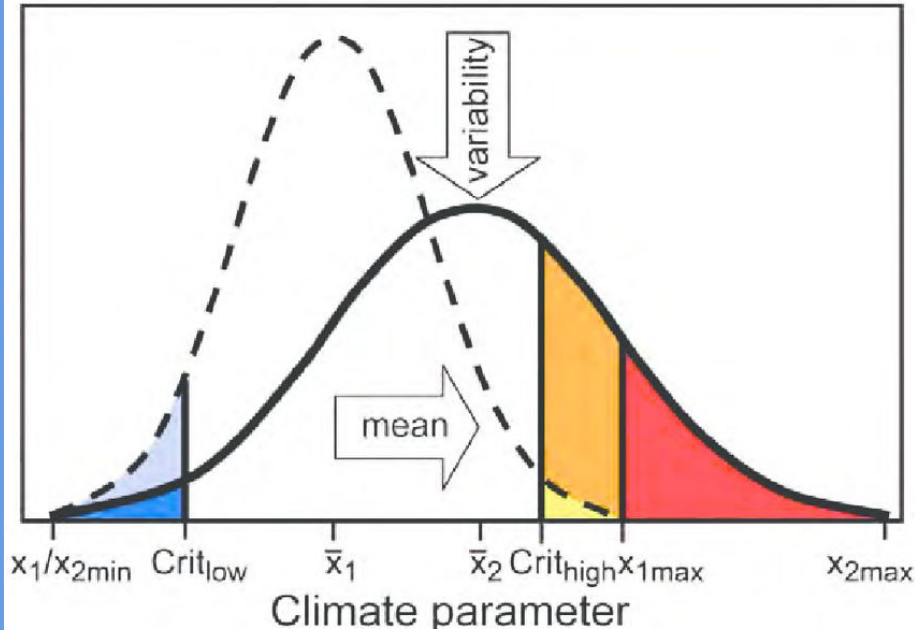
Problem

Solutions

Funding solutions



- **Stock of GHGs is a source of climate change**
- **There is fundamental uncertainty**



- Double CO2 concentration => warming [2 - 4.5] C
- Tail effects are bigger than average effects
- Second moments are crucial

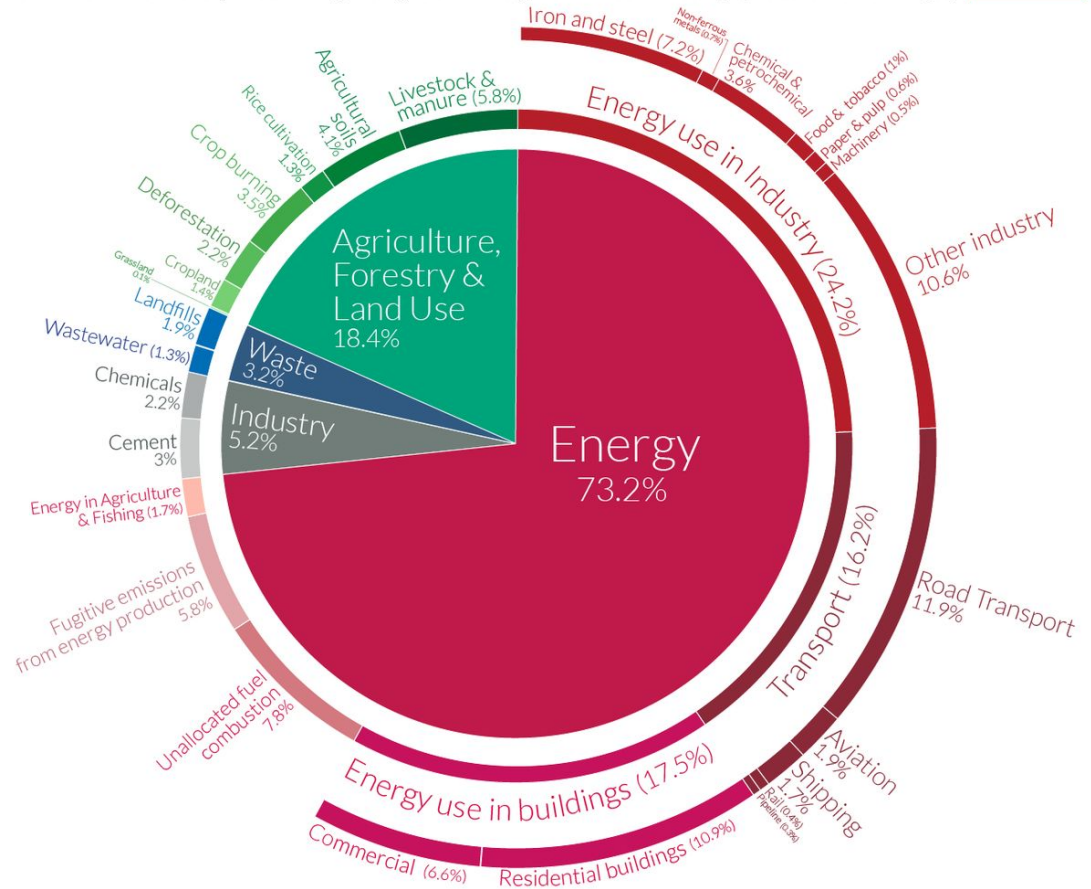
Global greenhouse gas emissions by sector

This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO₂eq.

Sources of emissions

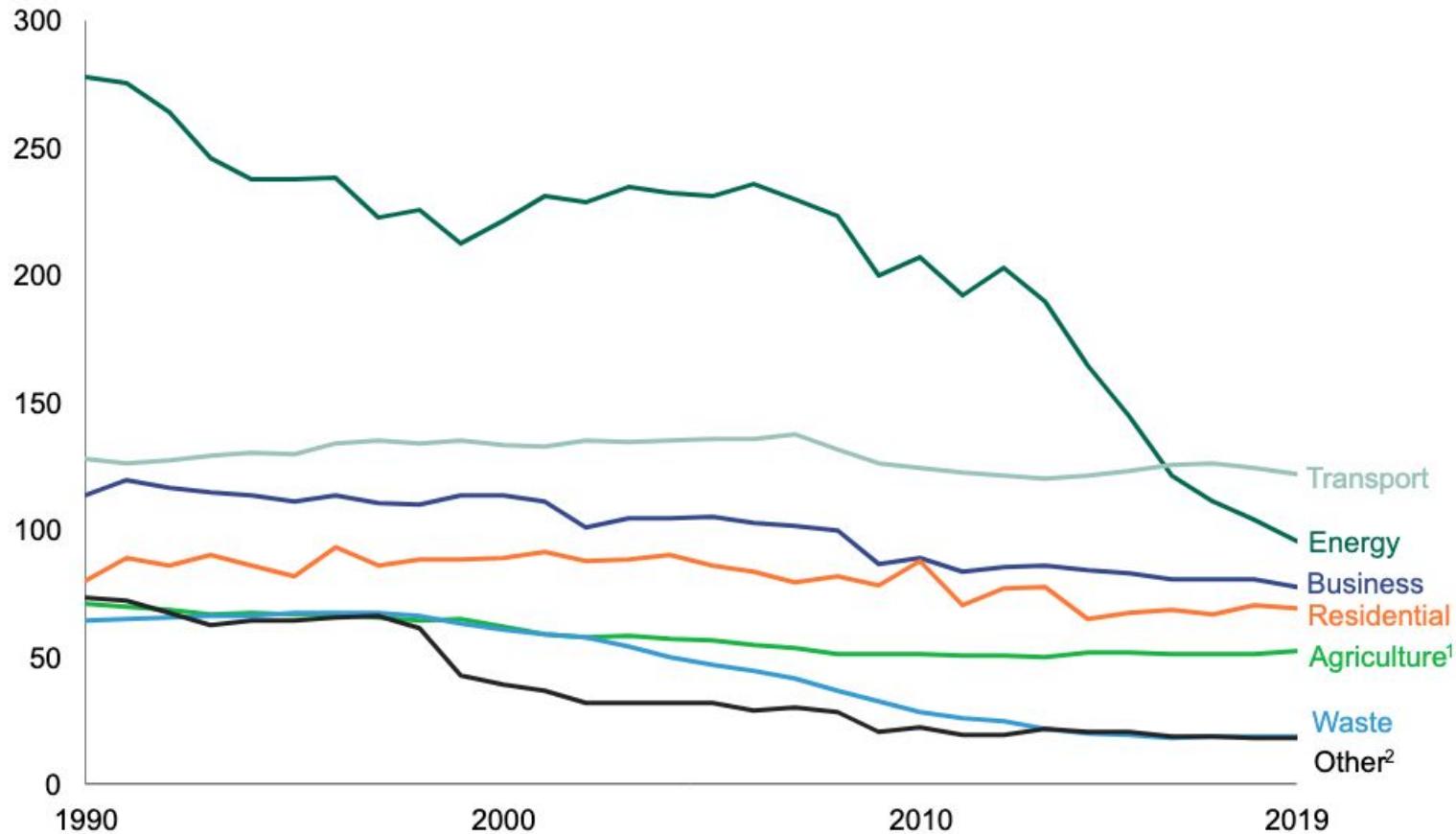
- Industry
- Agriculture
- Buildings
- Transport
- Construction

All aspects of global economy need transition



UK:

Million tonnes of CO₂ equivalent



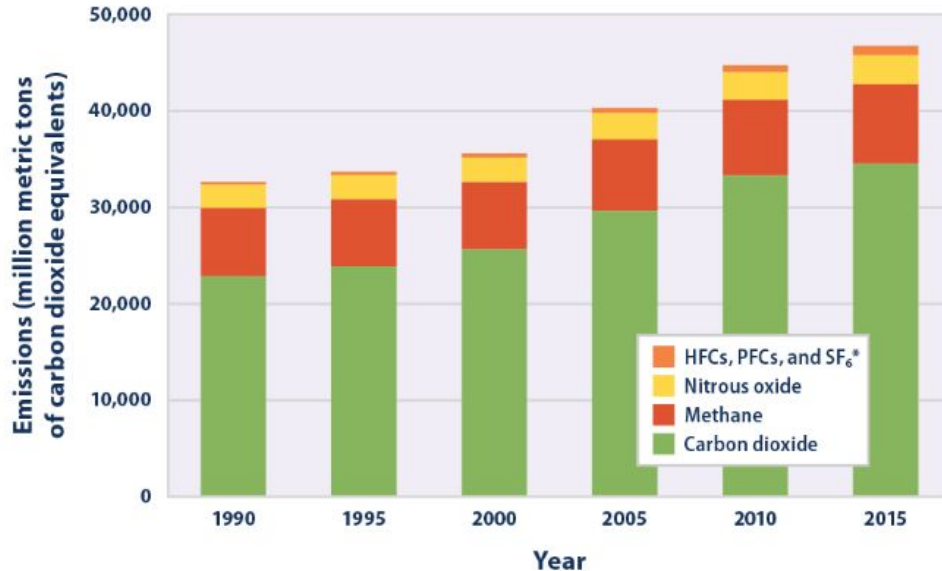
1. Includes Land Use, Land Use Change and Forestry (LULUCF)

2. Includes emissions from Public and Industrial Processes



Insufficient focus on non-CO2 mitigation

Figure 1. Global Greenhouse Gas Emissions by Gas, 1990–2015



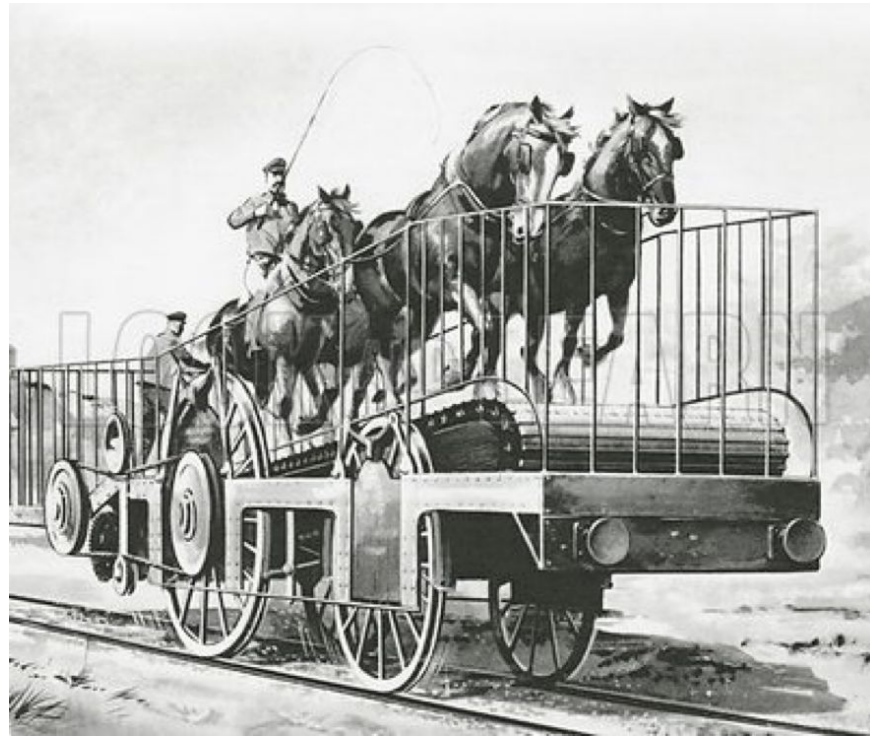
Methane - shorter half-life, more immediate effect of reduced emissions

Main source: animal agriculture

Solutions (analogous to alt. energy):

- Preference shift
- Alt. protein
- Increased efficiency (e.g. reduce food waste)

**Animal agriculture is an old technology -
we need to innovate, not iterate**

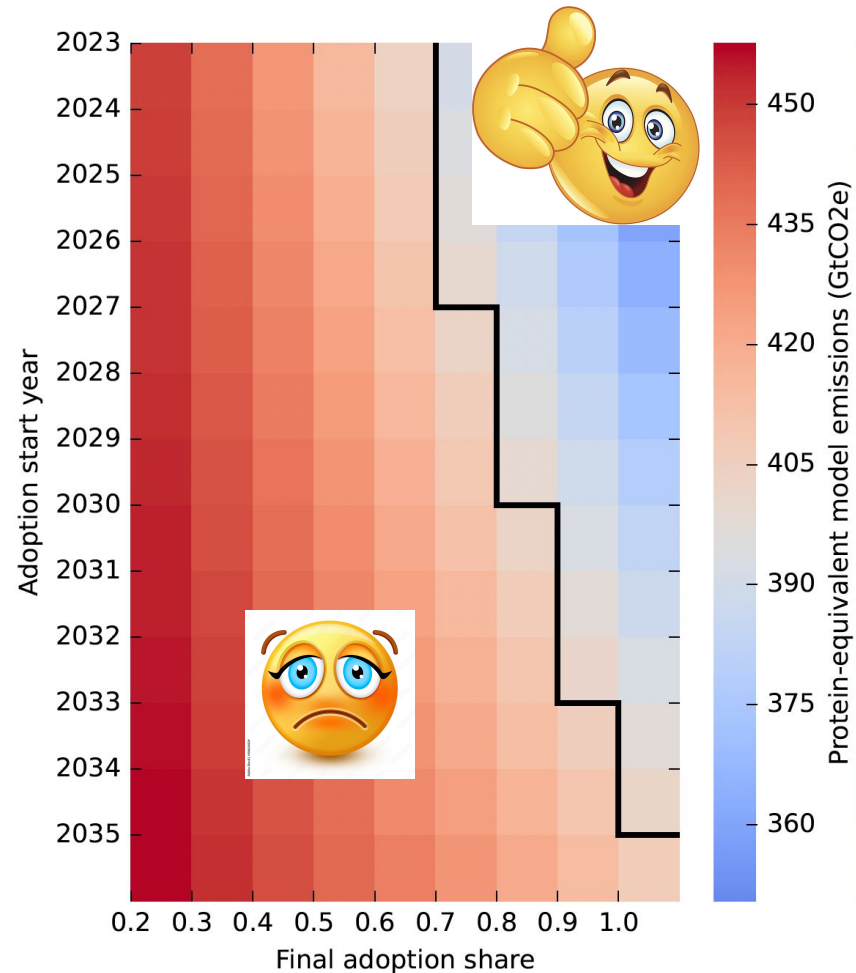




Replacing animal agriculture is urgent

- We have to replace 70% of animal food products with alternatives by 2050, if we start **now**.
- If we delay, we need to replace 80% or more.
- If we wait past 2035, we are too late.

Based on work with Vlad Oncescu

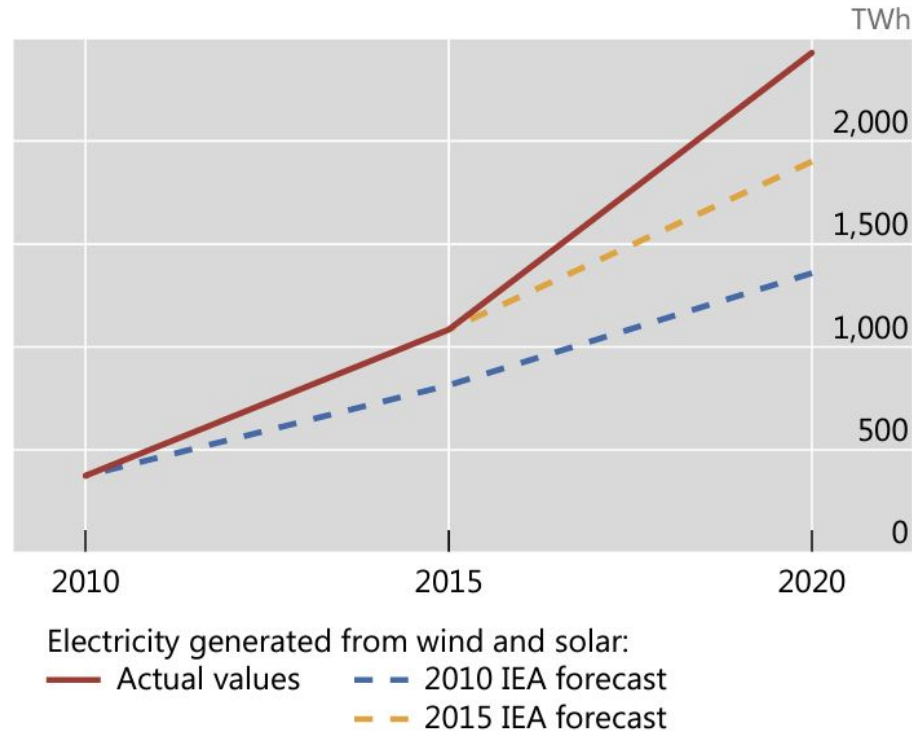




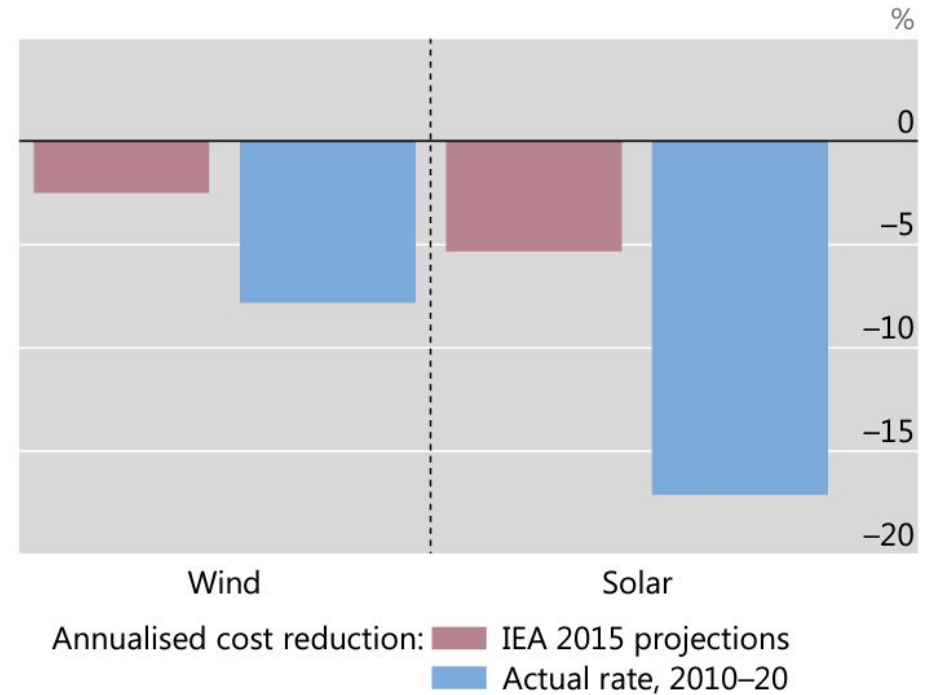
**Why I am optimistic about
climate change:
we have solutions!**

Alternative energy is on a good trajectory

Projected versus realised wind/solar generation



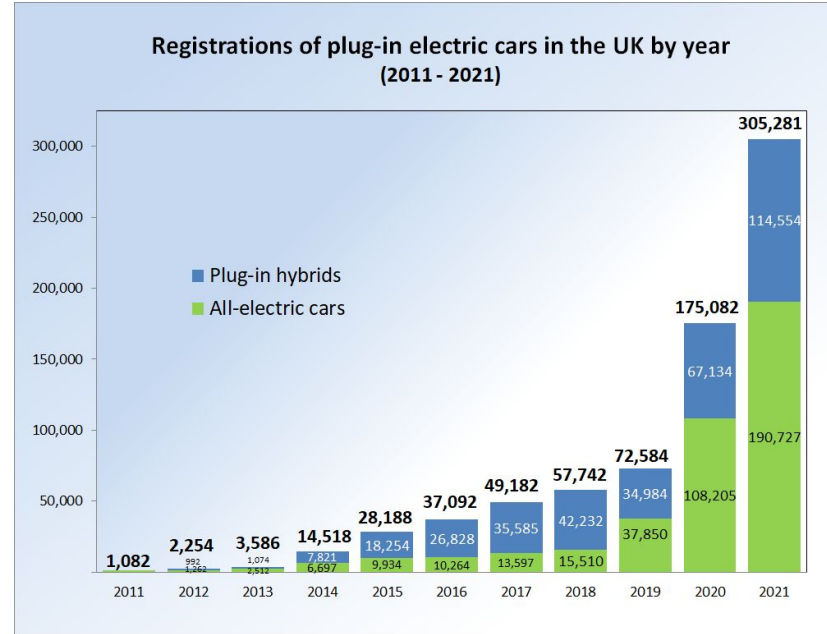
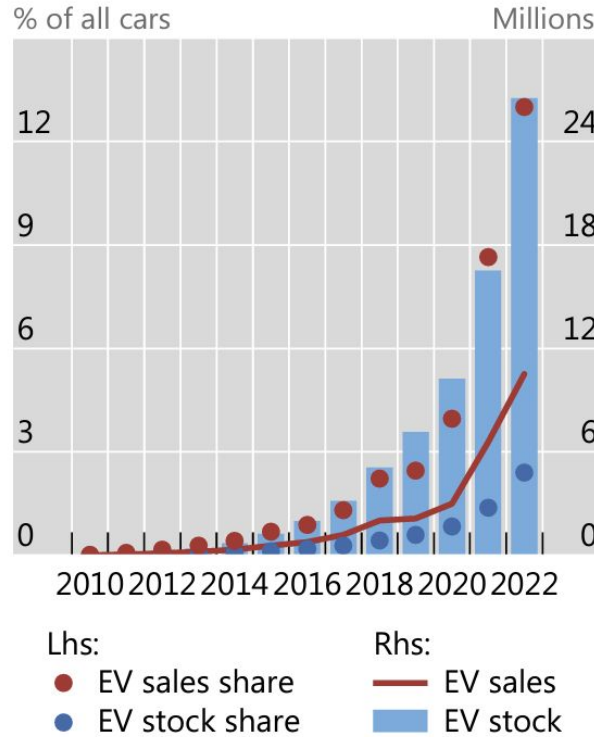
Projected versus realised wind and solar cost declines



Alternative transportation is on the rise



Global EV sales



Alternative food technologies are improving



- Plant-based



- Fermentation
(fungi biomass, or cause yeast grow proteins)

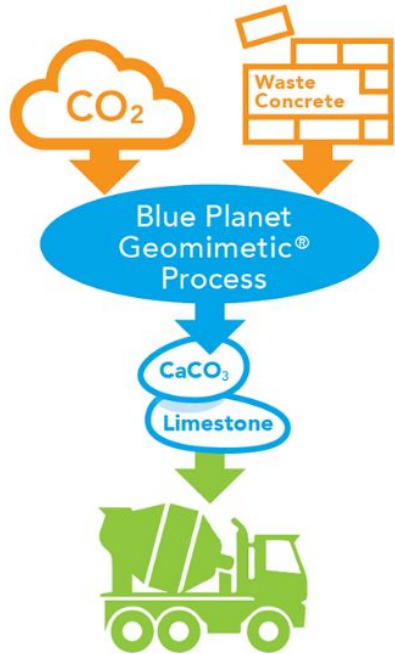


- Cultivated
(from a food production facility)


















Direct carbon capture technologies exist



Carbon capture companies

From sources across the web

 Carbon Engineering	▼	 Climeworks	▼	 LanzaTech	▼
 Carbfix	▼	 Newlight Technologies	▼	 Aker Carbon Capture	▼
 Carbon Clean Solutions L...	▼	 CarbonCure Technologies	▼	 SAIPEM	▼
 Chart Industries, Inc.	▼	 Calix Limited	▼		▼
 CarbonFree	▼				



Still lagging: adaptation



OFFSHORE DYNAMICS



NEARSHORE DYNAMICS



HABITAT



IMPACTS



CONSEQUENCES

IMPACT WITH
MANGROVES



IMPACT WITHOUT
MANGROVES



Offshore

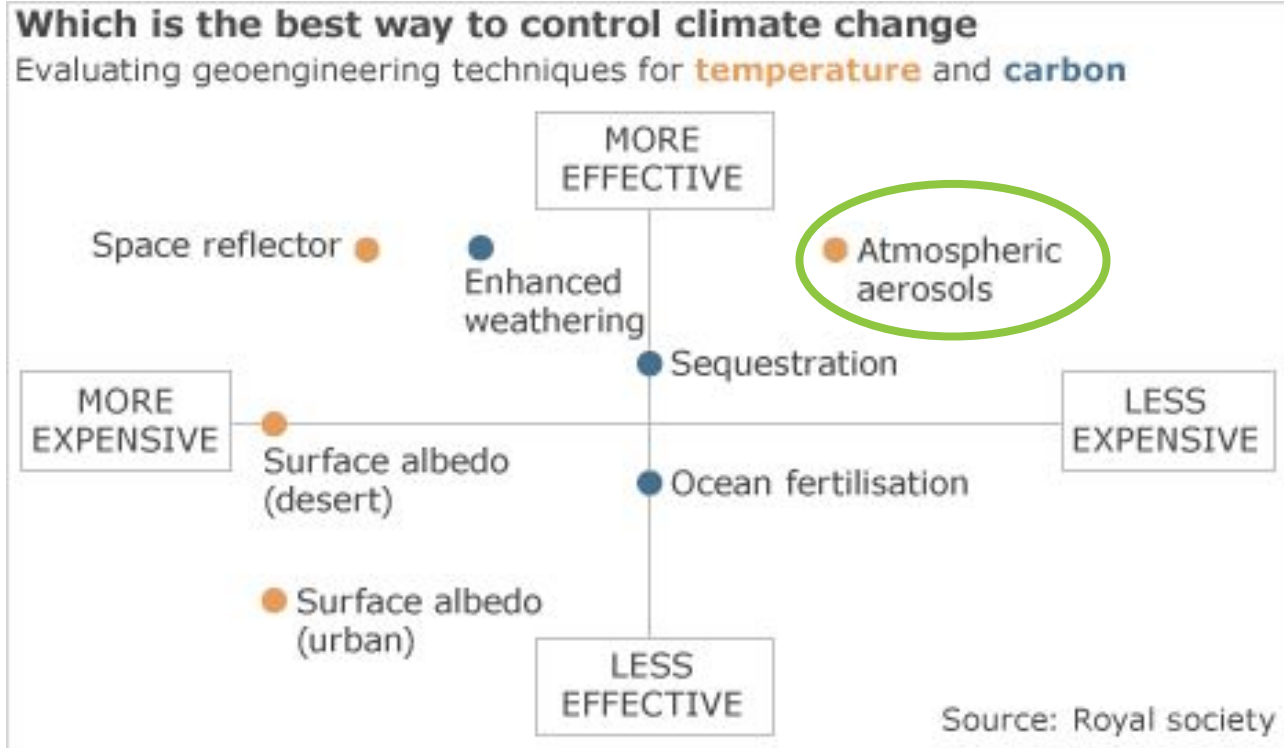
Nearshore

Onshore

Adaptation and mitigation have the same ultimate goals



Geo-engineering is there just in case

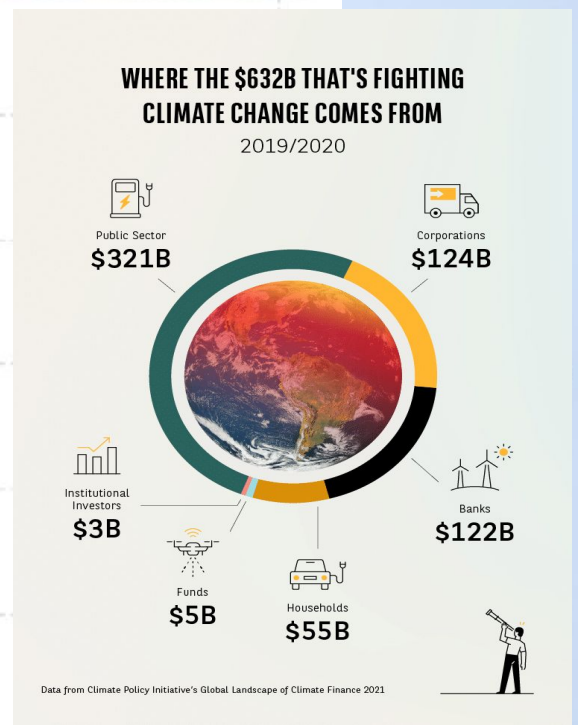
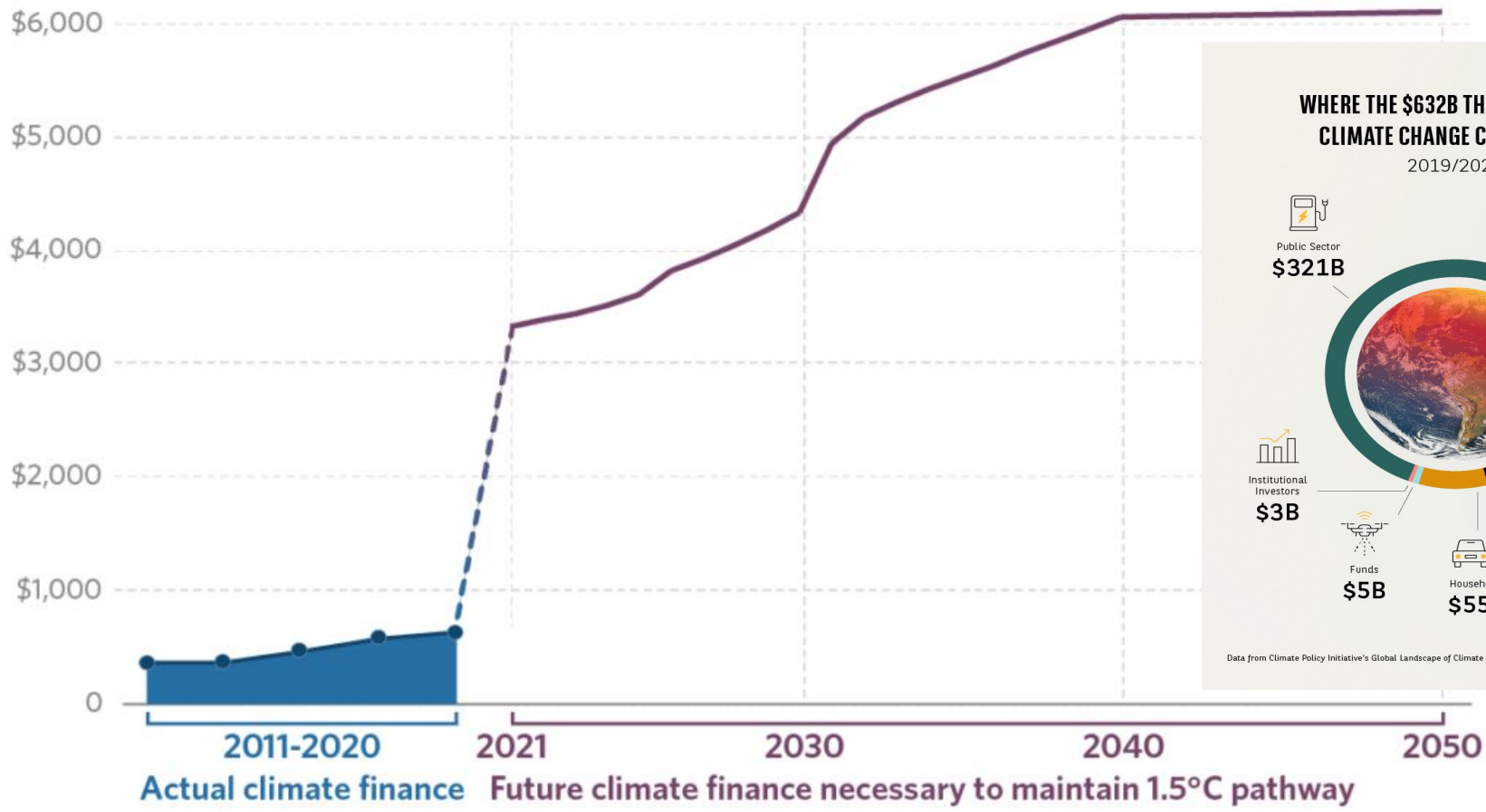




The solutions need to be funded to scale up

Figure 3: Global tracked climate finance flows and the average estimated annual climate investment need through 2050

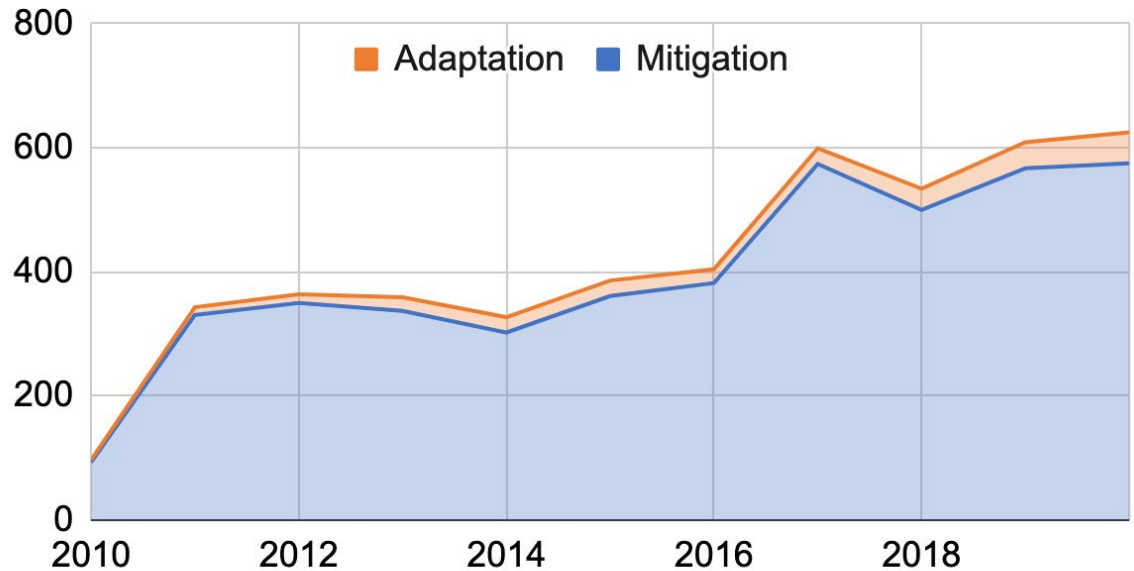
(USD billion)



Composition of funding is skewed towards mitigation

- Mitigation
- Adaptation
 - Man-made
 - Nature-based

Mitigation and Adaptation Spending (billion USD)



Adaptation spending needs



Adaptation spending
NBS



Adaptation Spending
Overall



Adaptation Spending
Needs

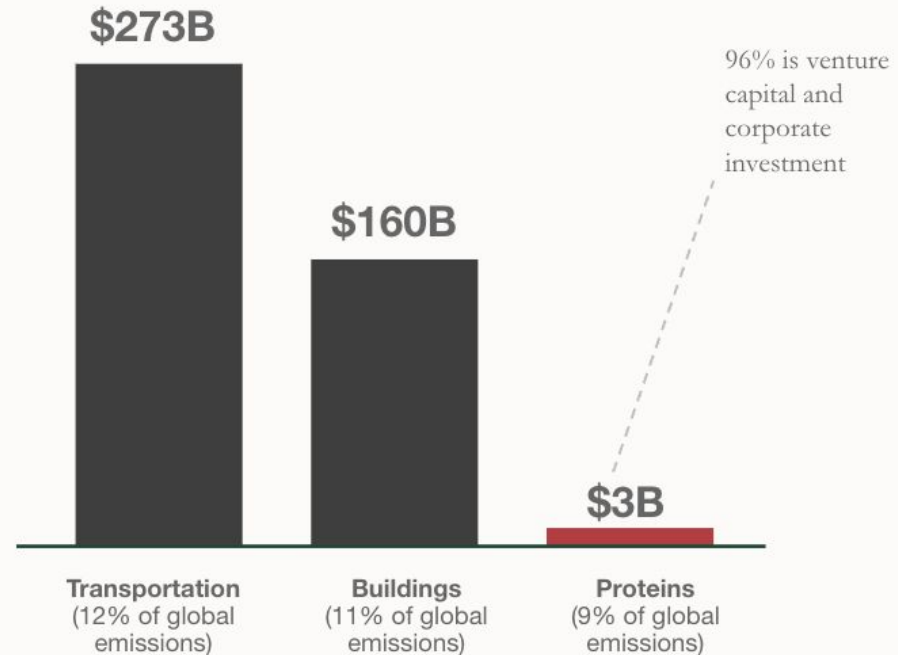


Global Financial Market Assets



Current funding for climate mitigation solutions by sector does not align with impact

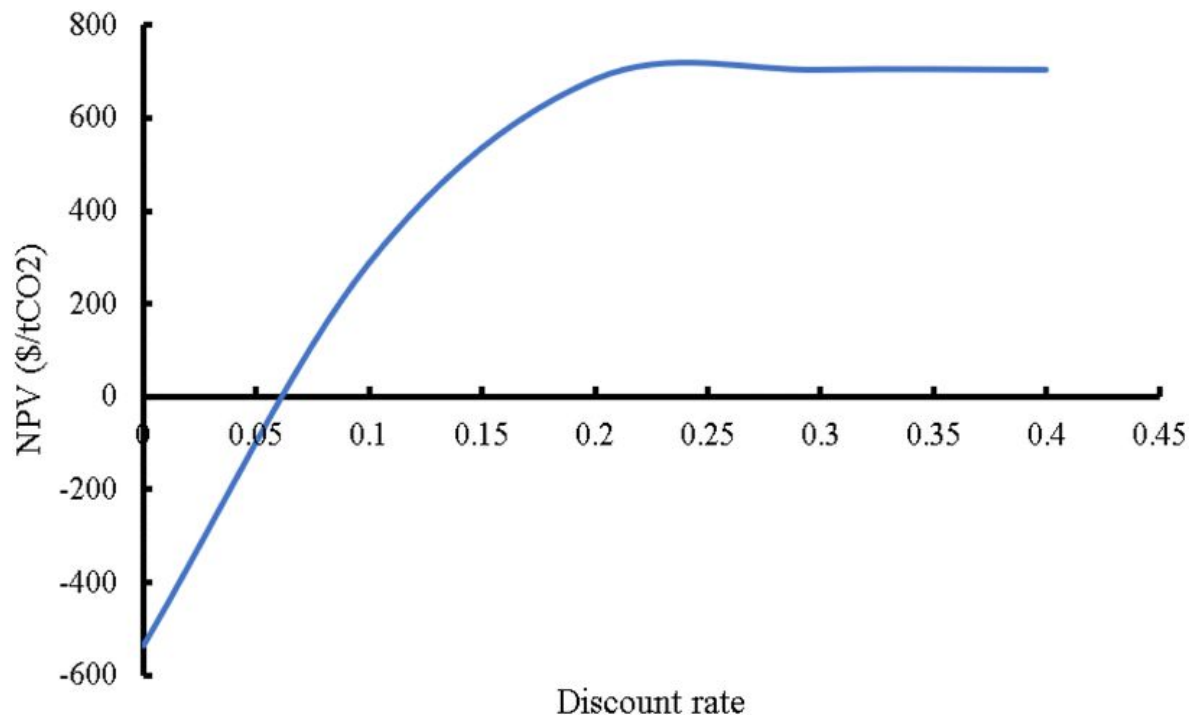
Estimated Global Funding in Solutions by Sector (2019-20)



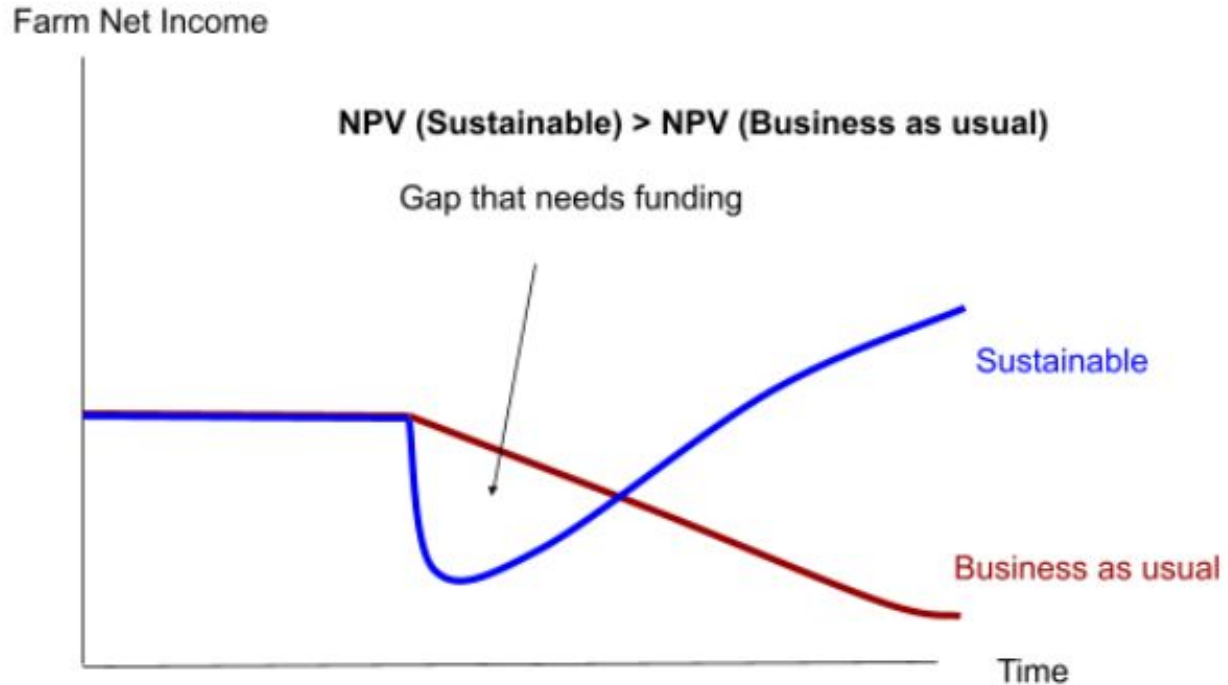
Private investors may need incentives

E.g.
NPV of DAC

DOI:
[10.1039/D2RA07940B](https://doi.org/10.1039/D2RA07940B)
(Review Article) *RSC Adv.*,
2023, **13**, 5687-5722



Temporal profile of investment is not generally attractive



*Based on work
with Anirban
Sanyal and
Bodo Steiner*

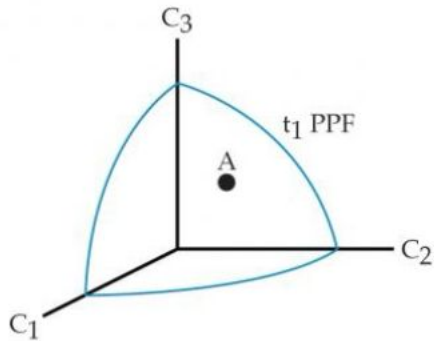


Greening portfolios confusion

- ⦿ Decarbonisation of portfolios may be counterproductive if funds are moved away from industries that need to innovate
- ⦿ Need to change language in conversation: not 2 industries (green vs. brown), but 3 (green/neutral/brown)
 - Implications for finance: need to incentivize reduction of GHG exposure *within industry*
 - Simply recognizing risks is not enough
 - Implications for macroeconomic modeling

Modifying macroeconomic climate transition models

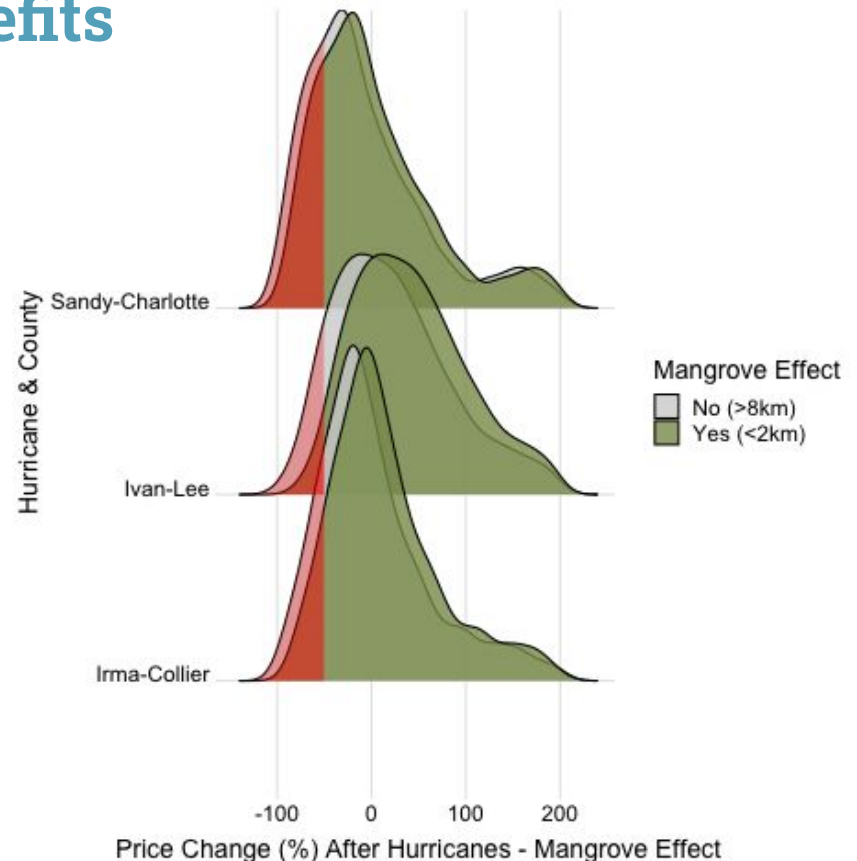
- Three sectors: brown, neutral and green
- Green defined as climate solutions
- Green has **negative** beta with respect to carbon tax
- Implication: **carbon tax moves investment from brown to green**, overall growth effect could be positive if (e.g.) green industry has IRS
- Financial institutions can hedge transition risk through exposure to green and not just divestment from brown: *implemented as carbon credits*
- Climate solutions are funded privately



Traditionally non-private solutions may have private benefits

E.g.
VaR for housing prices
is reduced by
mangrove investment

*Based on work with Ted Liu,
Michael Beck, and Brook
Constantz*





Challenges in attracting financial sector

- Temporal profile of payoffs
- Payoffs not easily financialized
- Payoffs are distributed across stakeholders
- Risks (enforcement, measurement)
- Scale



Overcoming

Challenges in attracting financial sector

Structured finance

NGO participation

Government support

Fintech/tokenization

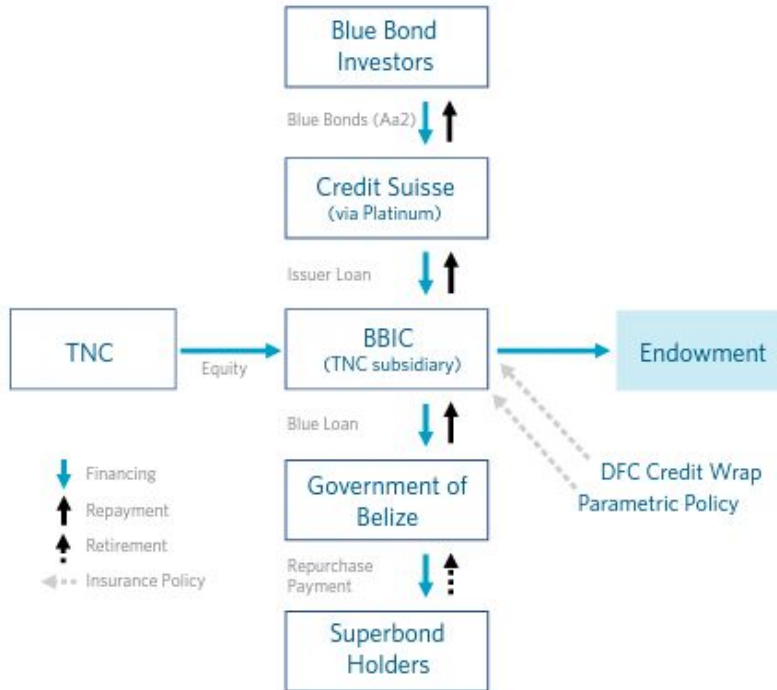
Other fin. innovation

- Temporal profile of payoffs
- Payoffs not easily financialized
- Payoffs are distributed across stakeholders
- Risks (enforcement, measurement)
- Scale

Co-benefits

Case study 1: Belize Blue Bond debt conversion

Debt Conversion Transaction Diagram



- Debt repurchase with a haircut (55c/\$)
 - Debt service payments redirected to Endowment for Conservation
 - Contract with TNC - **enforcement**
- Repurchase money lent to BBIC by CS with DFC insurance
 - **Philanthropy backing and brokering**
 - **Government insurance**
- CS securitized the loan as Blue Bond with Aa2 rating and 3% coupon in April 2022 going up to 6.04% from April 2026 onward
- Issue was oversubscribed

Success? Too soon to tell

A decorative image on the left side of the slide, showing a blue sky above a dark blue ocean.

Case study 2:

Advanced market commitment

- ⦿ Allows companies to pre-purchase offsets
- ⦿ Offsets come from yet-to-scale up carbon removal technologies

Innovation: expert intermediation



Case study 3: Crowdfunding



Climatize

- Small change from mobile purchases or intentional transfer
- Aggregated and invested in climate solutions (e.g. rooftop solar)
- Start with donations (increases eventual ROI)

Innovation: effortless investment , scale

Case study 4. Scaling technologies through market shaping

- Stage 1: innovation, venture funding
 - Stage 2: scaling up to niche market
- ... D O L D R U M S (most startups exit) ...

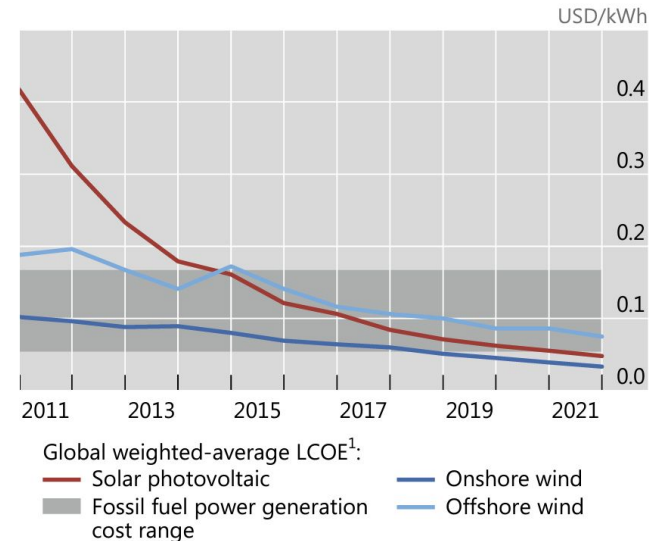
Catch 22:

Need to lower costs to allow for larger market share

Need to exploit economies of scale to reduce costs

- Stage 3: Market shaping with demand backstop to scale up to mass market

Cost of electricity by fuel source



¹ Levelised cost of energy.

Sources: IRENA; BP; EMBER; authors' calculations.



Climate solutions marketplace - a way to use government funding as a catalyst

Attractive investment profile

Traditional or impact investment

Green investment

Regulation helps, but not need for direct G or NGO involvement

Needs de-risking, ROI boost, or both

G insurance

G or NGO grant

Can help attract private investors

No hope for private investment

G or NGO funding

Climate justice goals



What is needed?

- ⊙ Governments can help
 - Catalyze private sector investment
 - Provide anti-greenwashing regulation
 - Require appropriate disclosures
 - Create functioning carbon markets
 - Create adaptation marketplace in addition to mitigation

Need marketplace for adaptation

WHAT ARE CLIMATE CREDITS?



ADAPTATION CREDITS

Adaptation credits support projects such as wetland restoration that reduce risks from present storms and sea level rise.



2025



MITIGATION CREDIT

Mitigation credits support projects such as reforestation that sequester carbon and reduce risks from future storms and sea level rise.



2050 and beyond



*Based on work
with Michael
Beck*



Summary

- We may succeed in limiting climate change
- Private financial markets are largely an untapped resource
- Governments can help attract private funding of climate solutions
- In addition to technological innovations, we need financial innovations



Thank you!