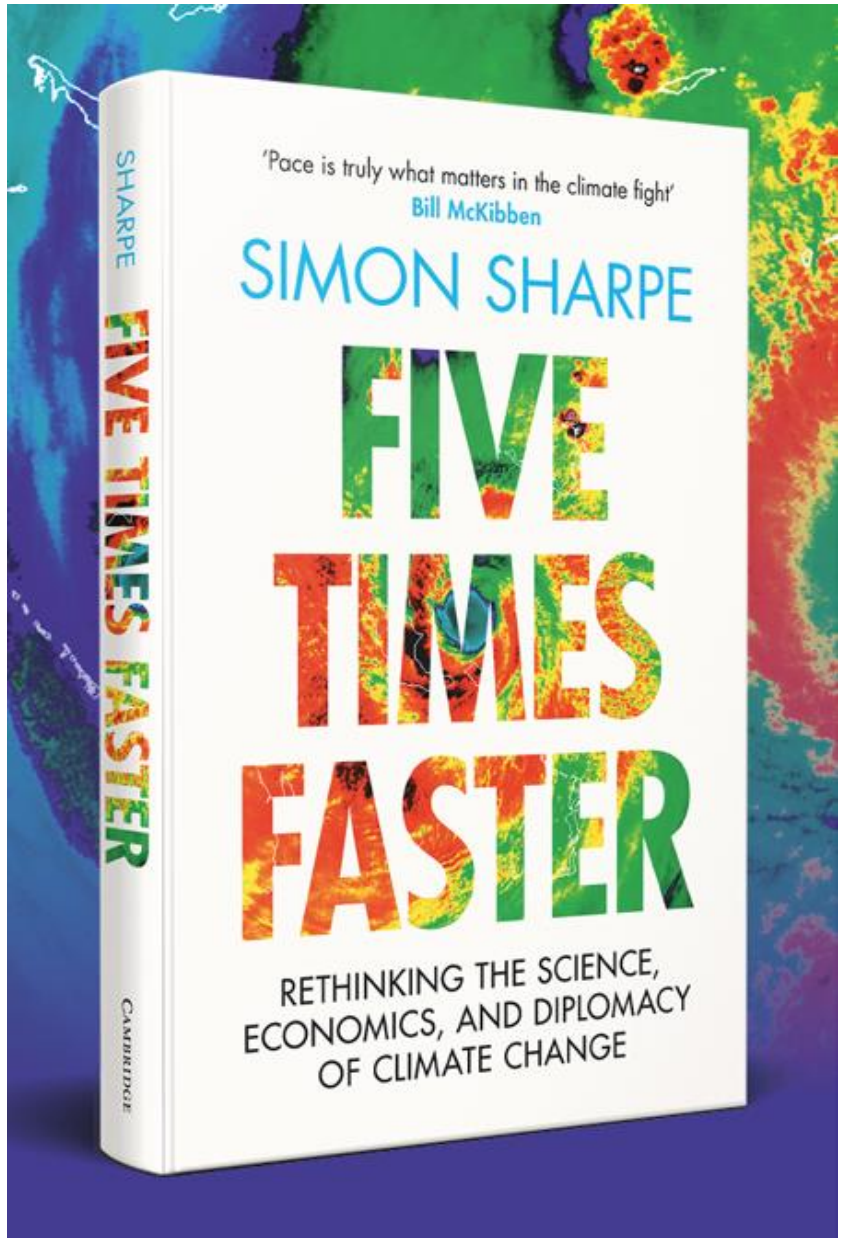


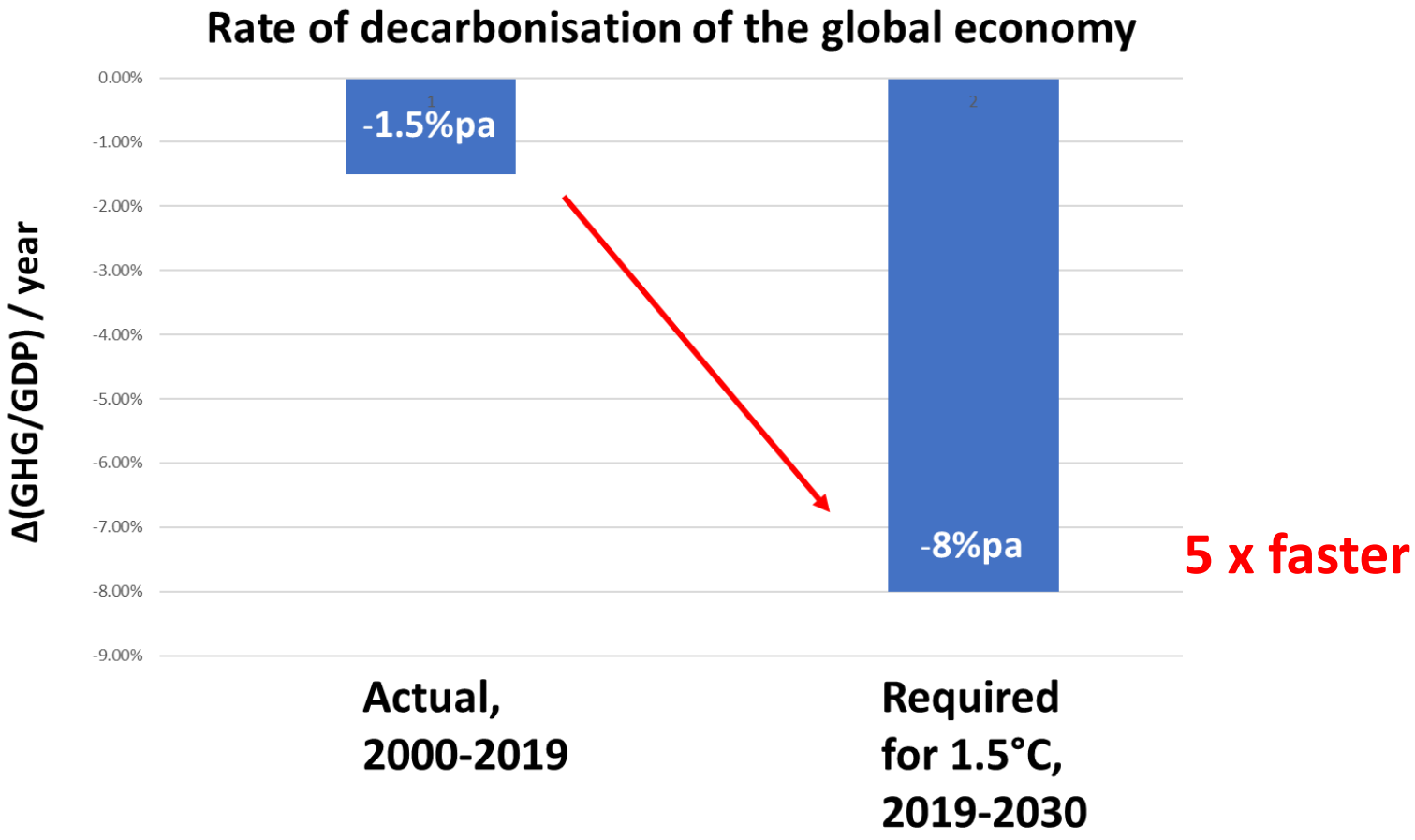

# FIVE TIMES FASTER

***Rethinking the science, economics, and diplomacy of climate change***

**Simon Sharpe**

**Slides for public use, accessible at fivetimesfaster.org**

**With illustrations by Dionne Kitching**

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**For faster change in the visible infrastructure of factories, cars, and power plants…**

**We need to change some of the invisible infrastructure of ideas and institutions**

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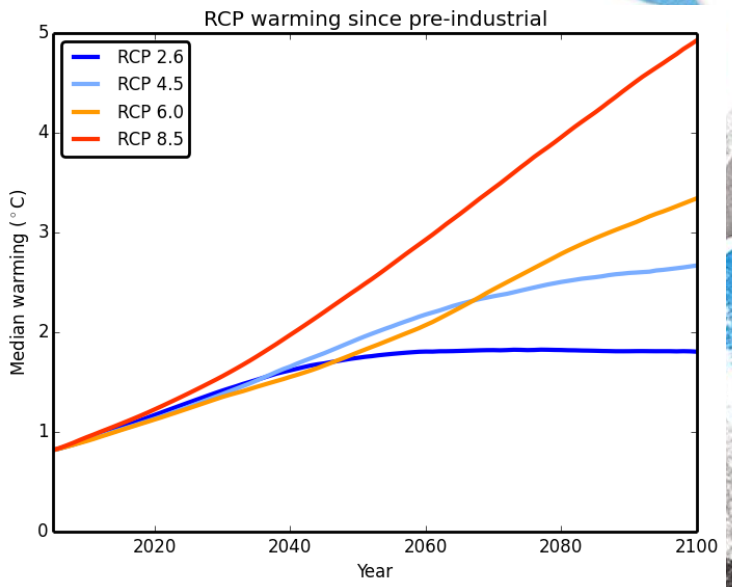
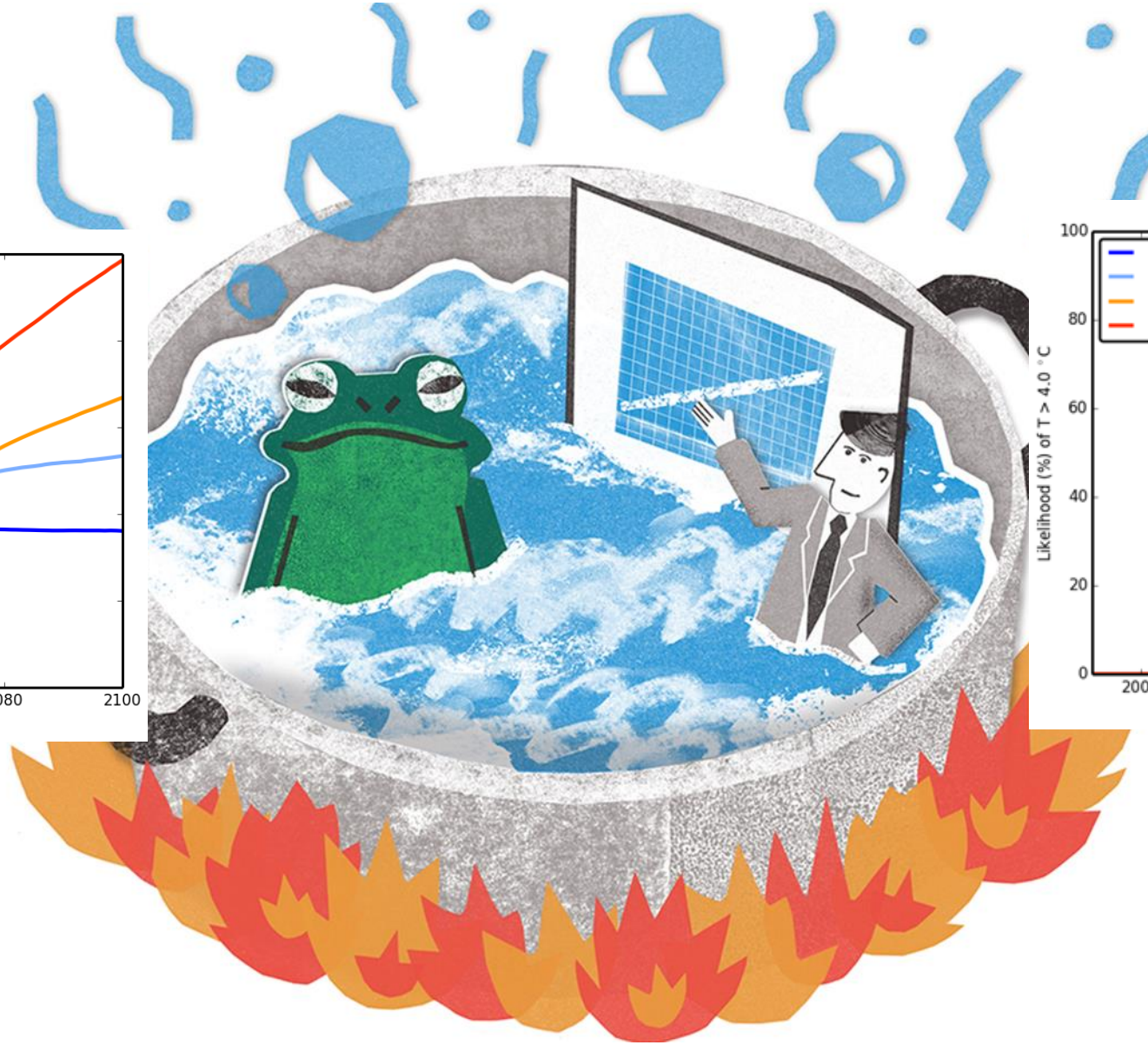
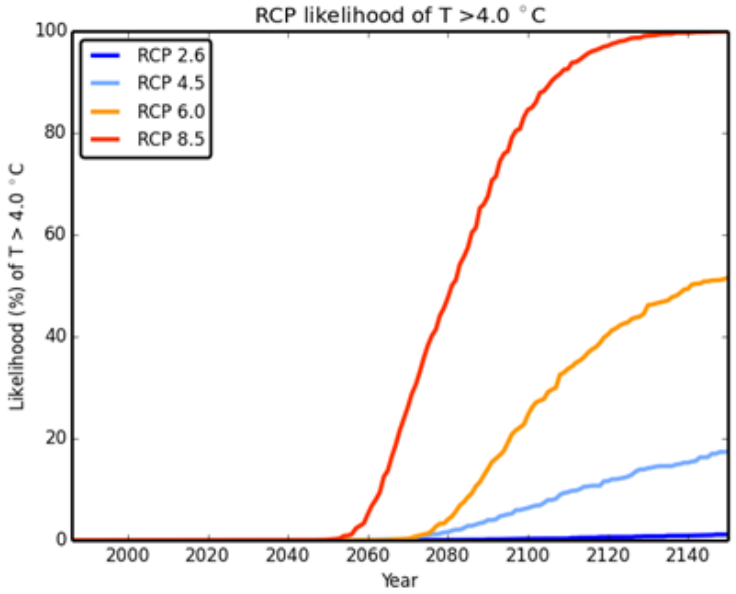
# SCIENCE

# Prediction

# Risk assessment






What's most likely, and how does it affect us?

What's the worst that could happen, and how likely is it (as a function of time)?



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## Risk assessment focuses mainly on the worst case

Light damage

Heavy damage

Collapse: a threshold of non-linear impact

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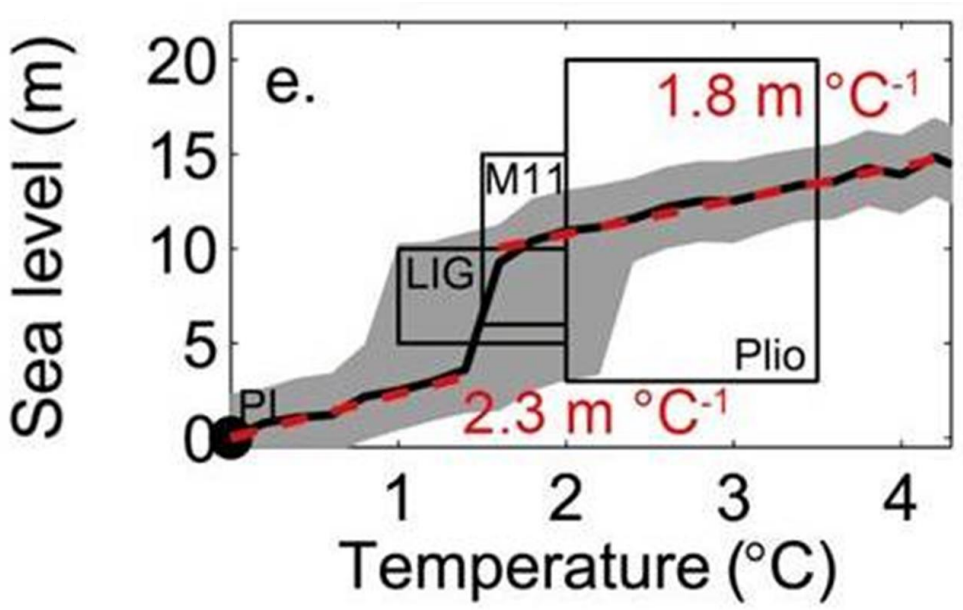
## Risk of exceeding London's limit of adaptation to sea-level rise

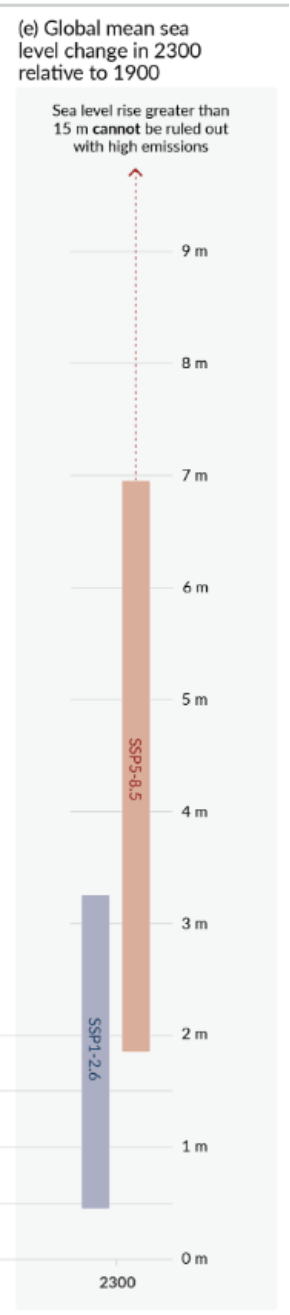
Estimated engineering limit for the protection of London against sea level rise: **~5m**

*Source: Reeder, T., et al., 2009. Protecting London from tidal flooding: limits to engineering adaptation.*




Long-term committed sea-level rise in response to sustained global temperature increase of 2 degrees: **>10m**

*Source: IPCC AR5 Working Group I*

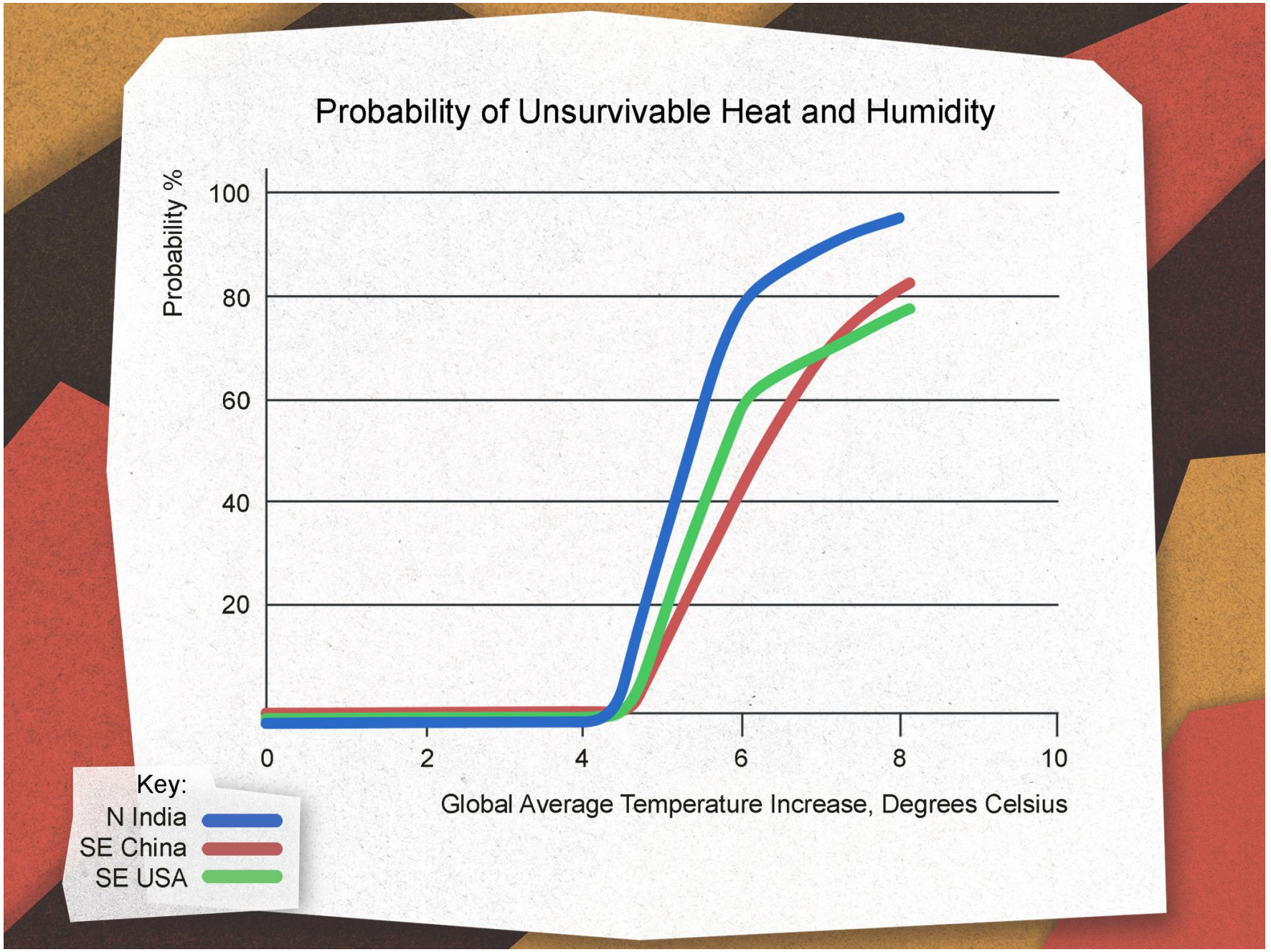



Plausible worst case sea-level rise by 2150: **>5m**

Plausible worst case sea-level rise by 2300: **>15m**

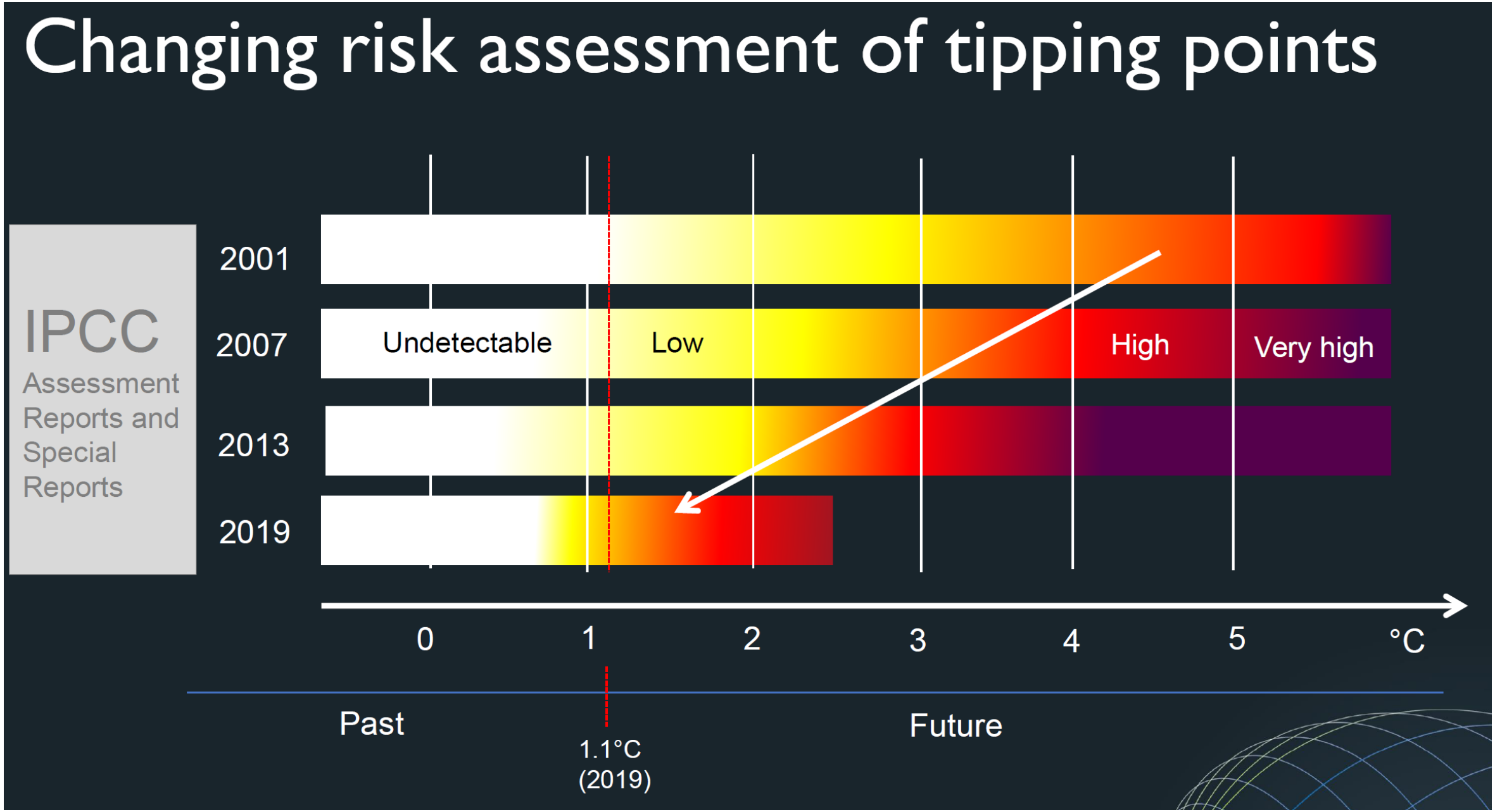
*Source: IPCC AR6 Working Group I*

## Risk of heat and humidity combinations exceeding limit of human tolerance for heat stress



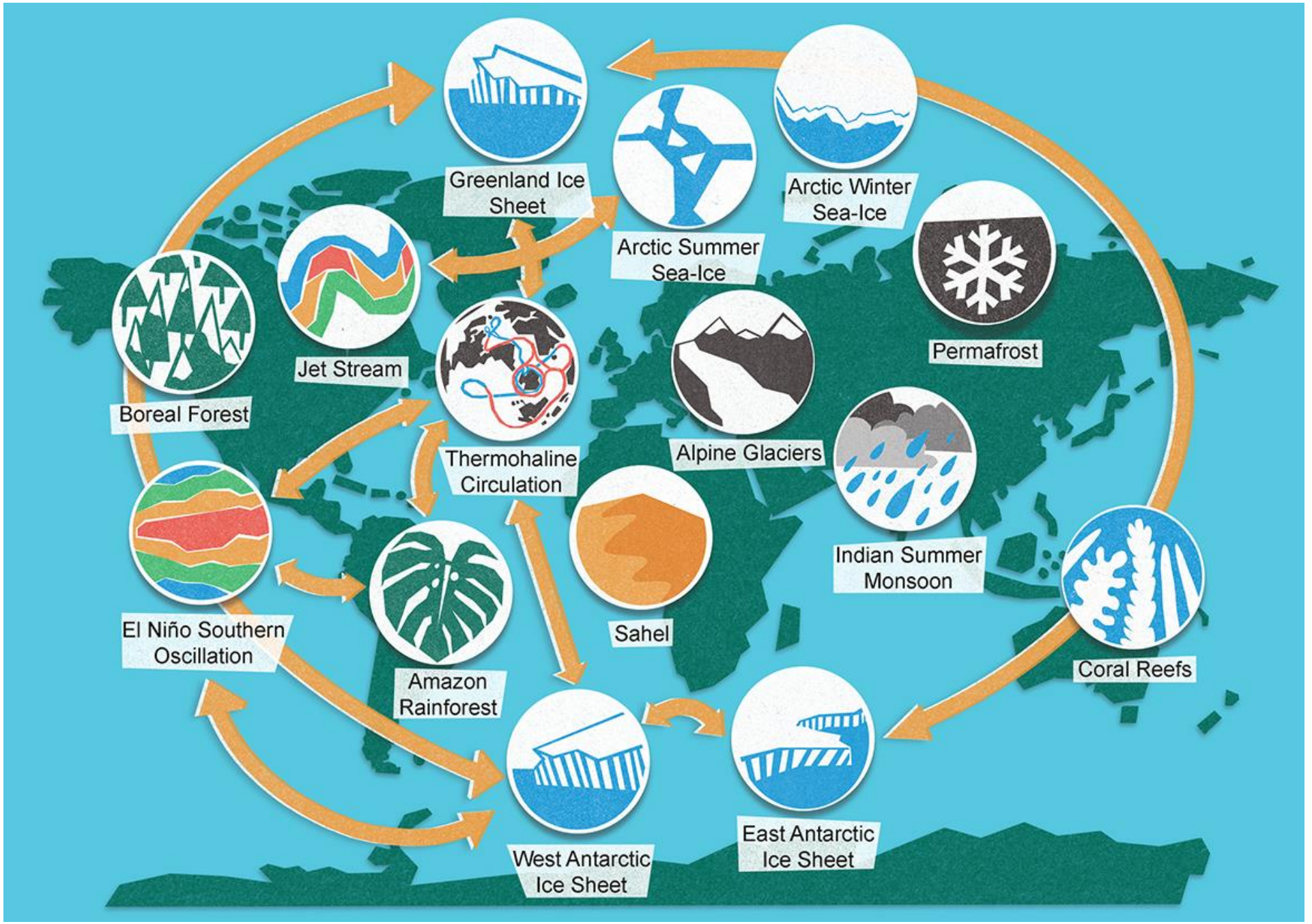

*Source: Kjellstrom et al in King, D. et al., 2015. Climate Change: A Risk Assessment*

# Changing risk assessment of tipping points




Source: Timothy Lenton

**Each tipping point we pass increases the likelihood of passing others**

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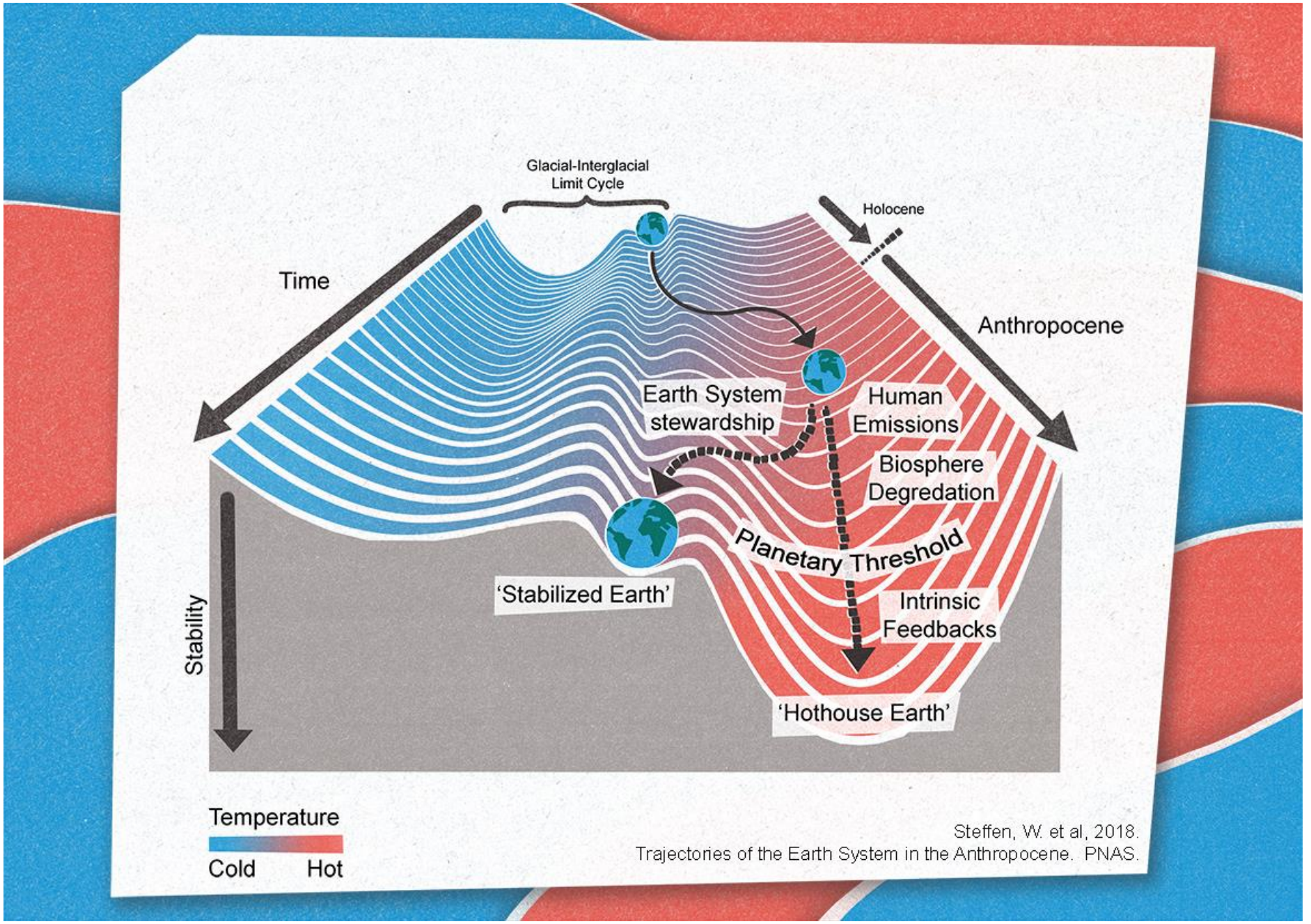
**Scientists have limited confidence in the stability of the Earth system, on timescales that matter to human civilization**

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# ECONOMICS

**Equilibrium:** *'a situation in which nobody has any immediate reason to change their actions, so that the status quo can continue, at least temporarily'*

(Oxford dictionary of economics)

Meeting climate goals requires…

*'rapid and far-reaching **systems transitions…** unprecedented in terms of scale'*

*Intergovernmental Panel on Climate Change (2018)*

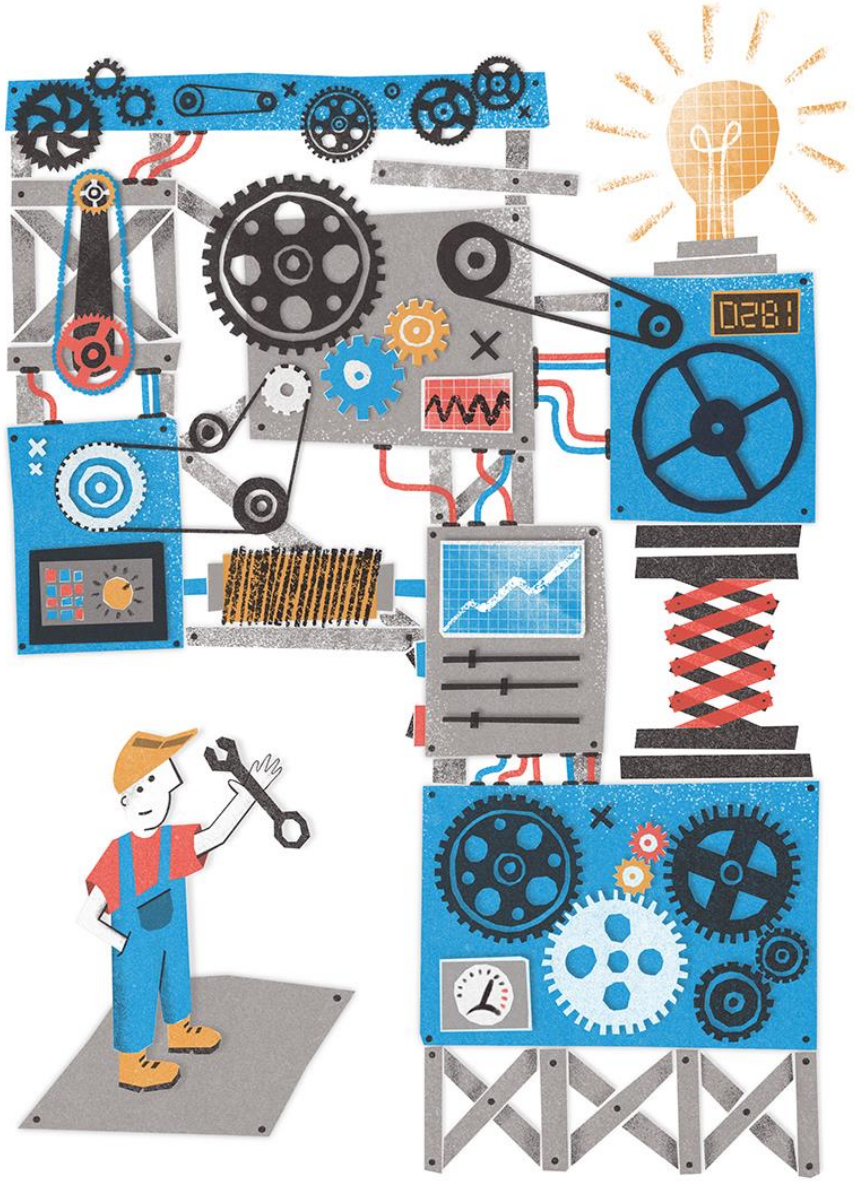
# Equilibrium economy

Static

Predictable

Limited possibilities

Role of policy: fix it when it fails




# Disequilibrium economy

Evolving

Uncertain

Unlimited possibilities

Role of policy: steer its evolution in desired direction

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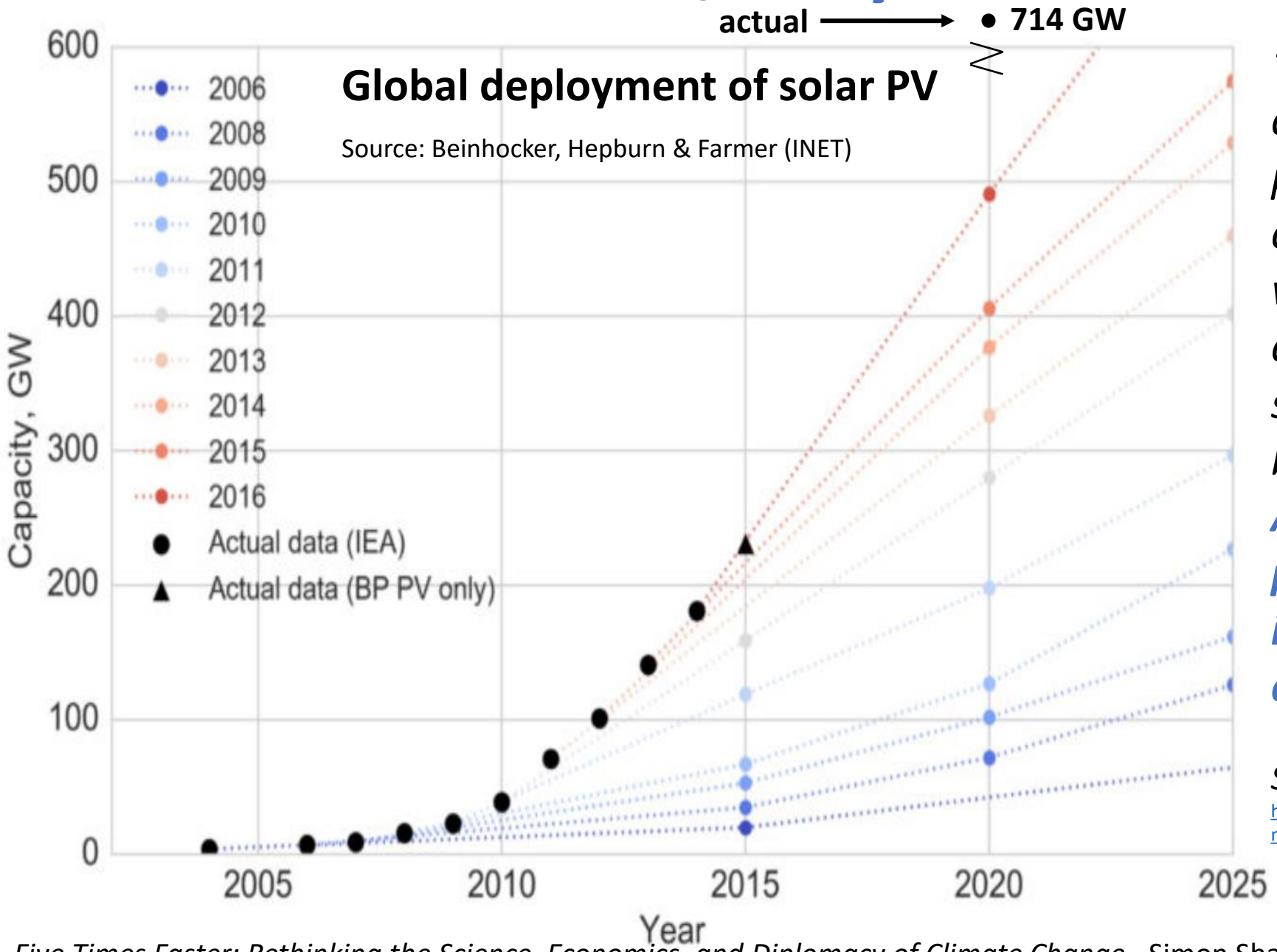
# Investment beats tax, early in a transition




*"Today, renewable energy is cheaper than coal in many places in the world, all major car manufacturers are working on several electric car models, and cities are starting to switch to electric buses.*

***All of this was achieved with policies focussed on new investments, not with carbon taxes."***

*Stephane Hallegatte & Julie Rozenberg*
https://blogs.worldbank.org/climatechange/all-hands-deck-mobilizing-all-available-instruments-reduce-emissions

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**Investing in new technologies directly strengthens reinforcing feedbacks:**

- **Learning by doing**
- **Economies of scale**
- **Emergence of complementary technologies**
- **Investment - innovation - increasing demand**


**Taxing the old technology, early in a transition, has no such self-amplifying effect**

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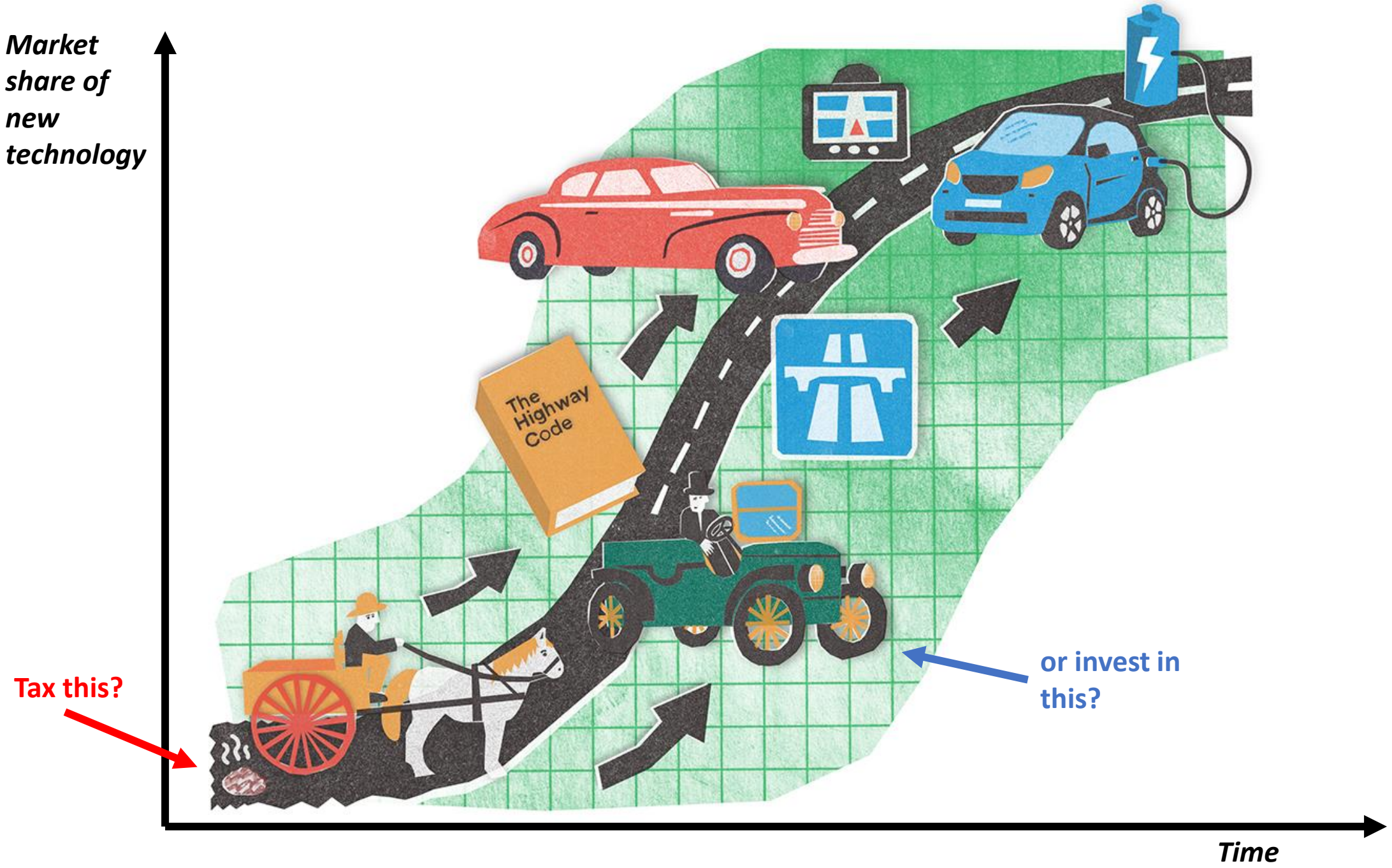


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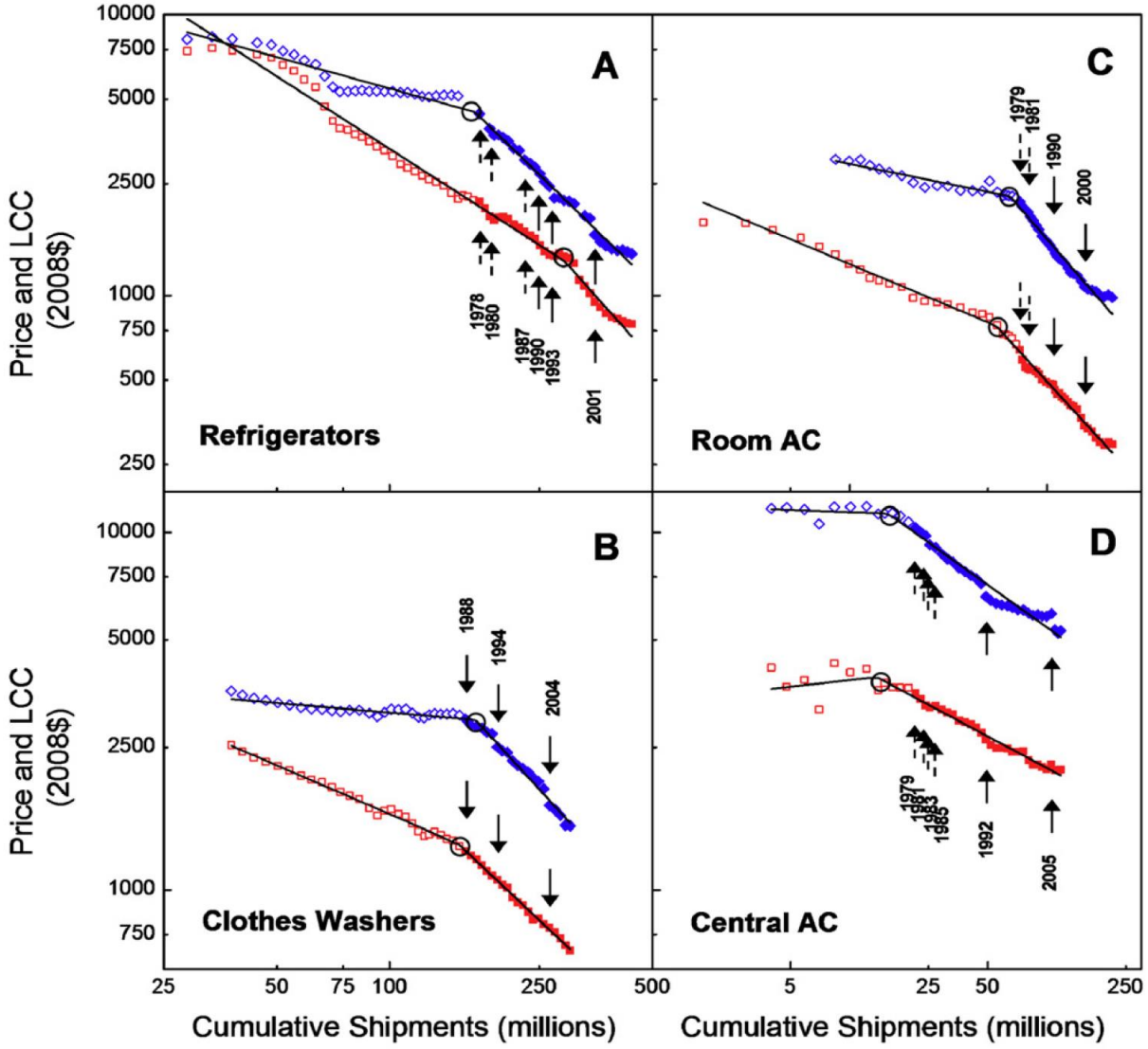
# Regulation can reshape the fitness function of a part of the economy, incentivising innovation




***"In contrast to the classical picture of the impact of efficiency standards, the introduction and updating of appliance standards is not associated with a long-term increase in purchase price; rather, quality-adjusted prices undergo a continued or accelerated long-term decline."***

*A retrospective investigation of energy efficiency standards: policies may have accelerated long term declines in appliance costs*
R D Van Buskirk, C L S Kantner, B F Gerke and S Chu

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**Regulation can redirect the flow of finance, forcing it to do some useful work**

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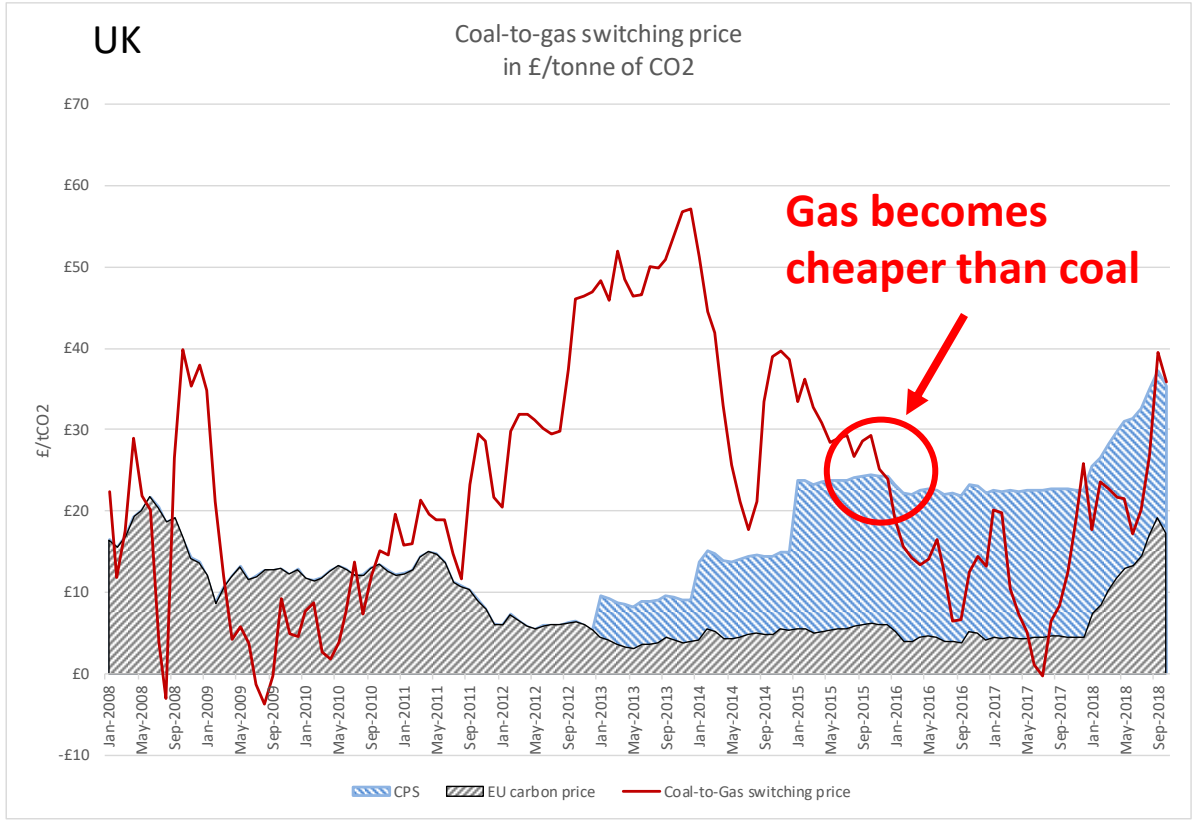
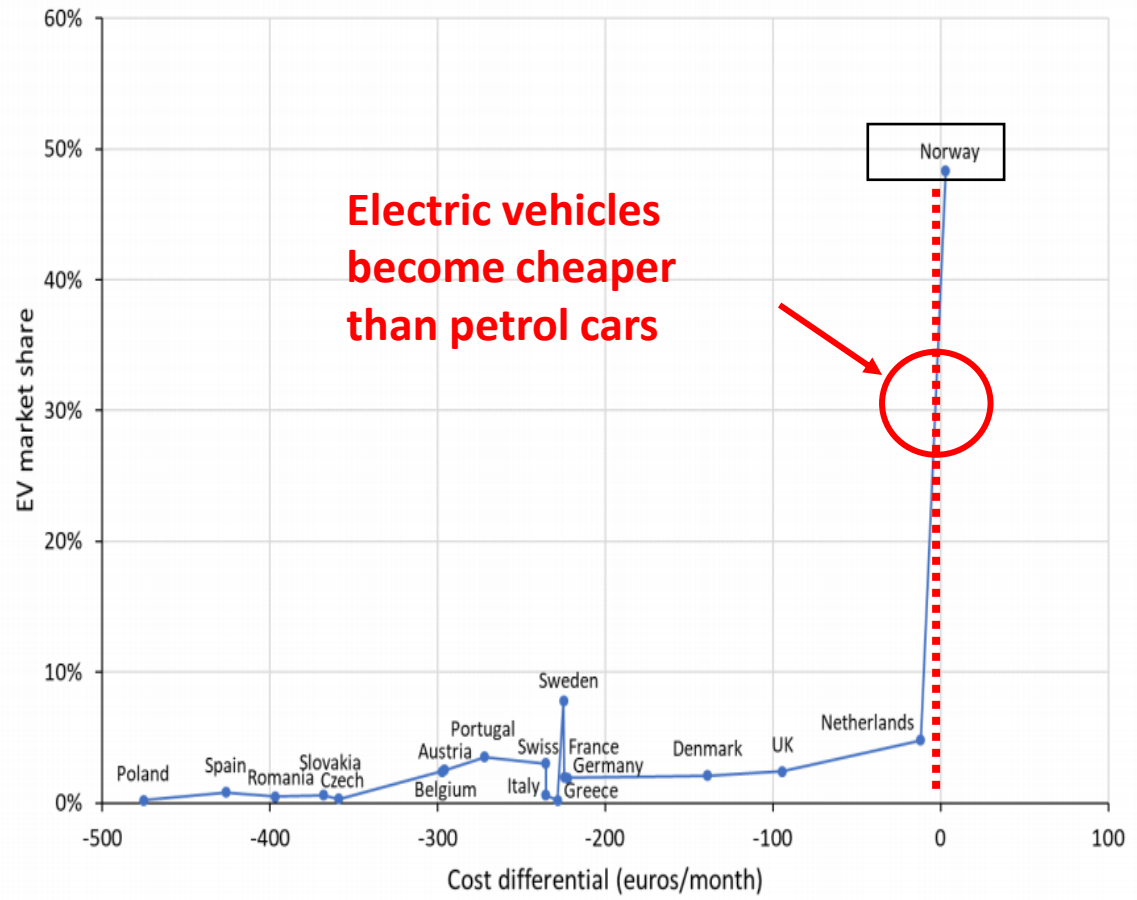
# Tax should target tipping points

## World's fastest power sector decarbonization



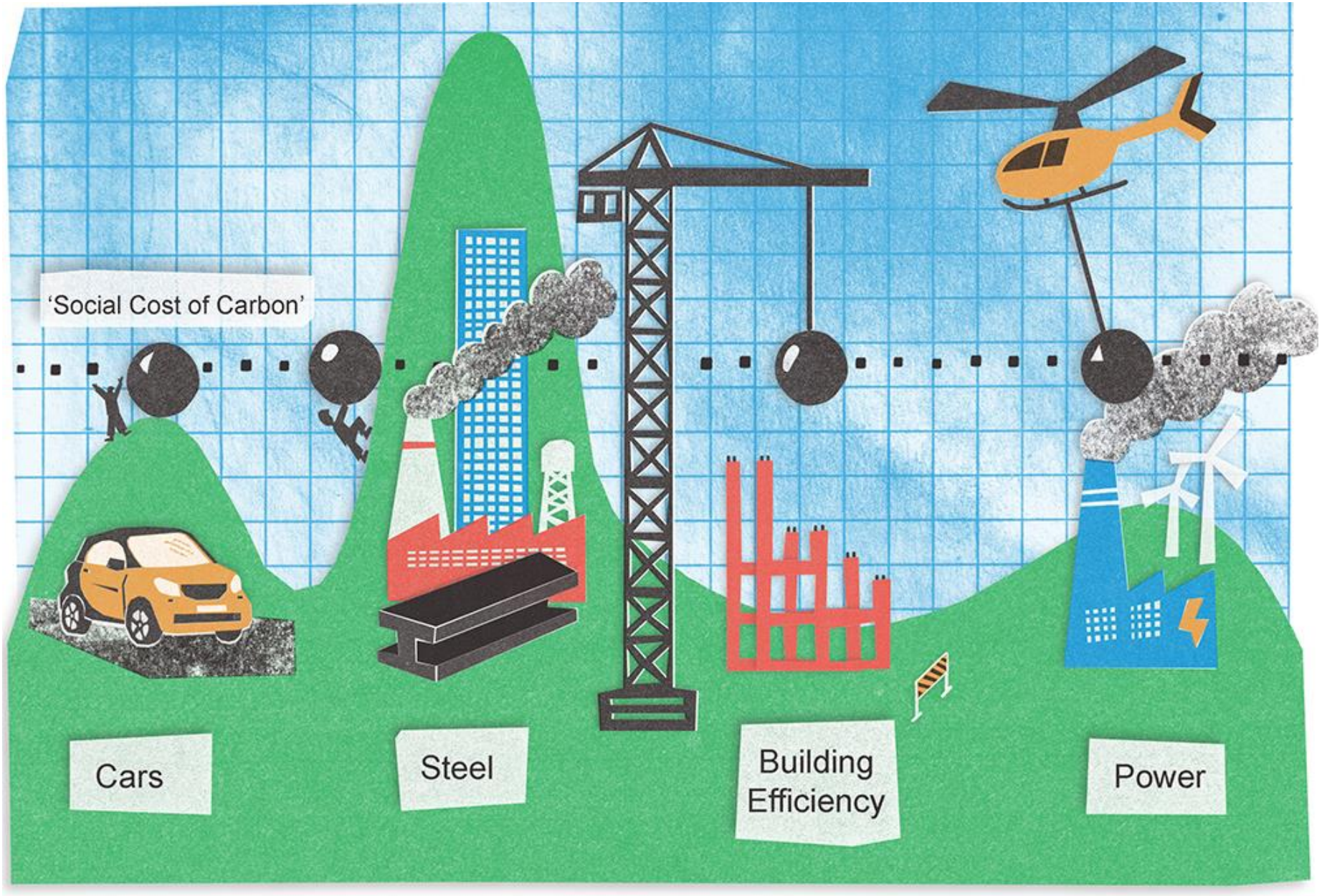

**Grey shading:** EU emissions trading carbon price
**Blue shading:** UK carbon price floor
**Red line:** coal-to-gas switching price

## World's fastest transition to electric vehicles




Sharpe & Lenton, 2021. Upward-scaling tipping cascades to meet climate goals: plausible grounds for hope

# An equal carbon price across the whole economy is dynamically inefficient



# Path dependence

**The easiest next step doesn't necessarily lead along the easiest path to your destination**

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## Least cost marginal change does not necessarily lead to least cost structural change

Offshore wind was described in 2014 as ***"among the most expensive ways of marginally reducing carbon emissions known to man".*** Burning biomass was then a cheaper way to marginally reduce emissions.

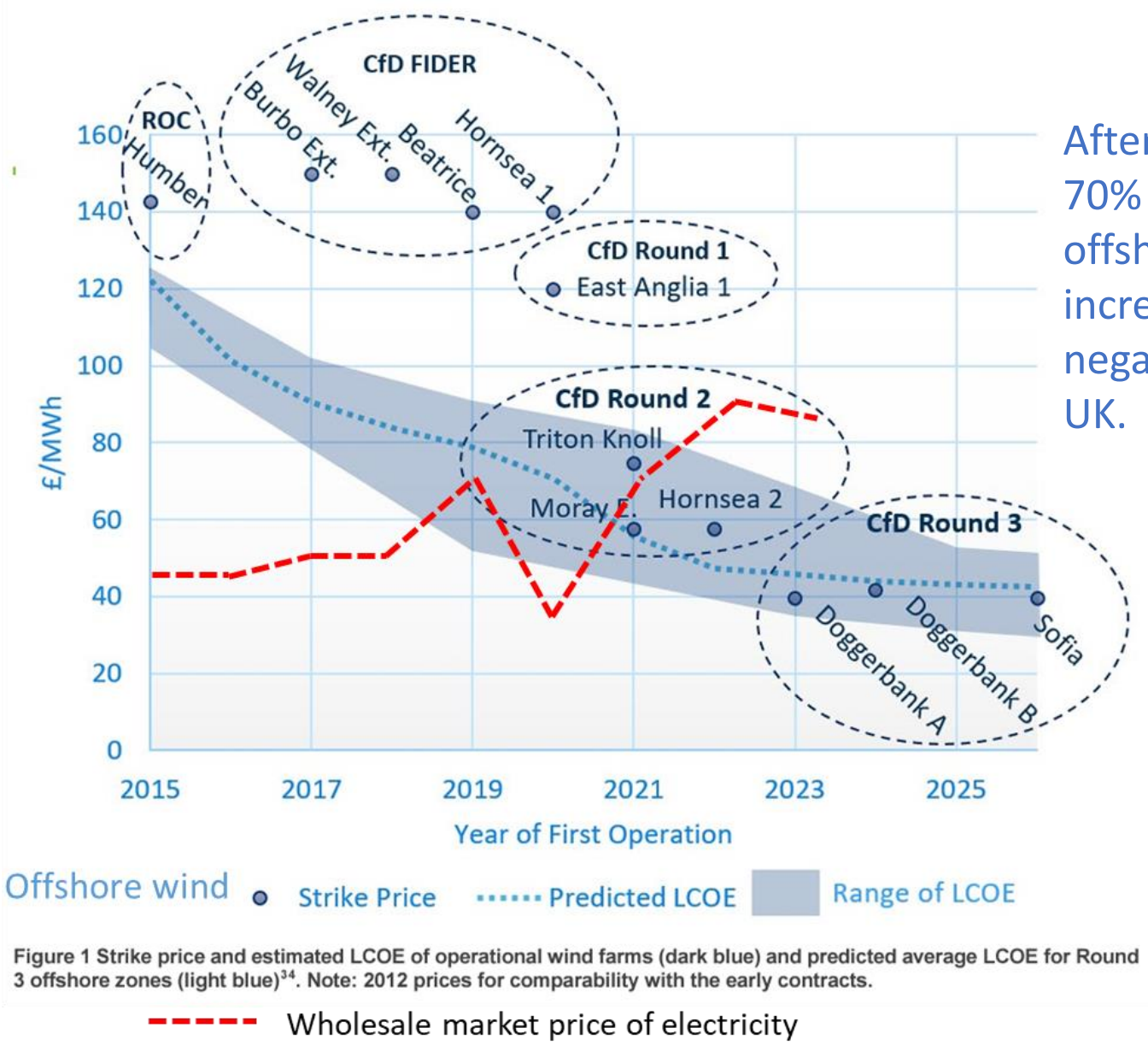


Figure 1 Strike price and estimated LCOE of operational wind farms (dark blue) and predicted average LCOE for Round 3 offshore zones (light blue)[34]. Note: 2012 prices for comparability with the early contracts.

After falling in cost by 70% over a decade, offshore wind is increasingly becoming negative-subsidy in the UK.

Source: Carbon Trust, 2020. *Policy, innovation and cost reduction in UK offshore wind.*

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# Path dependence

**The easiest next step doesn't necessarily lead along the easiest path to your destination**

**Present choices determine future options**

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**New possibilities for the economy are created faster than we can explore them**

**In a universe of effectively unlimited options, there is no optimal pathway of economic change through time**

**The path is made by walking**

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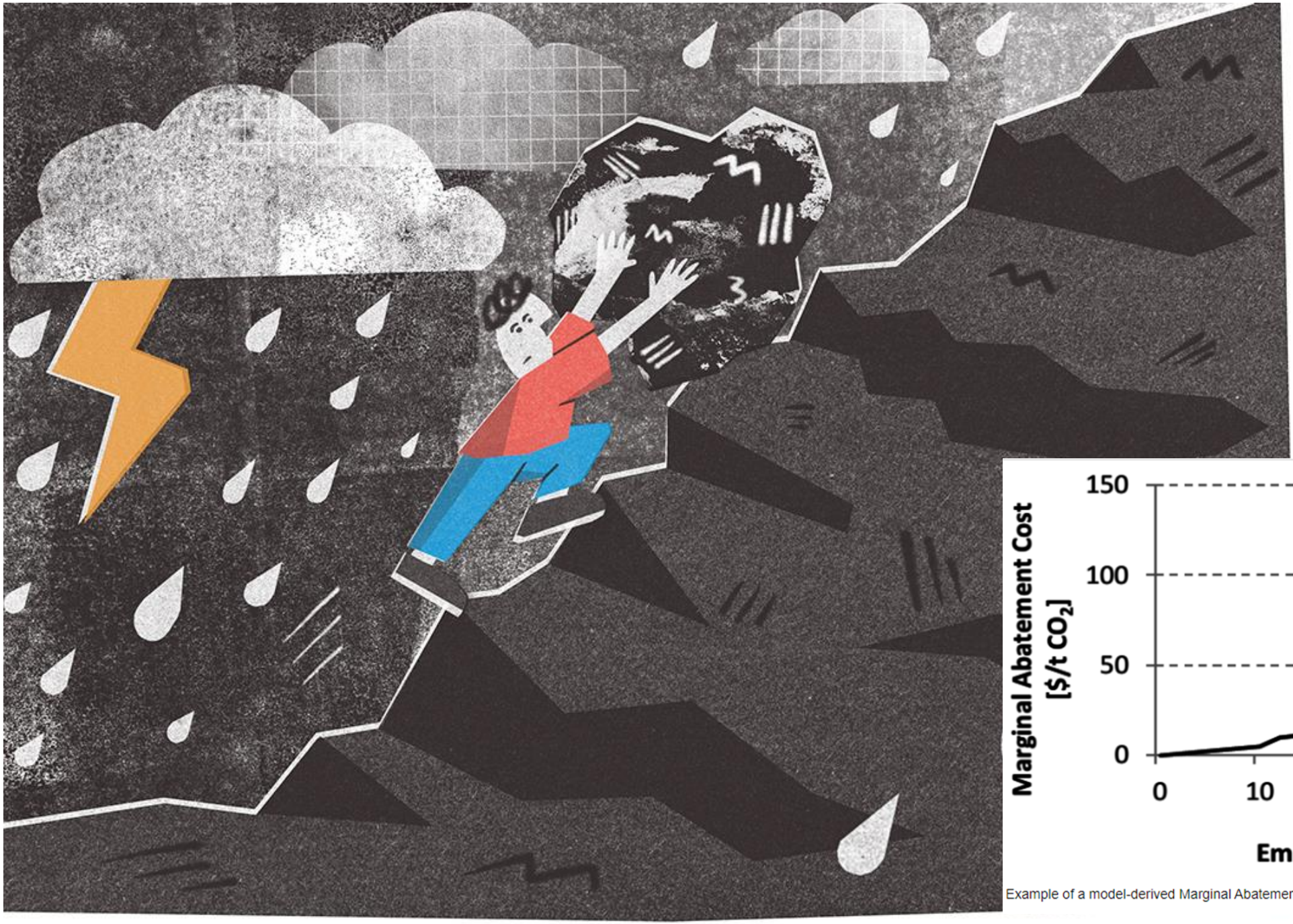
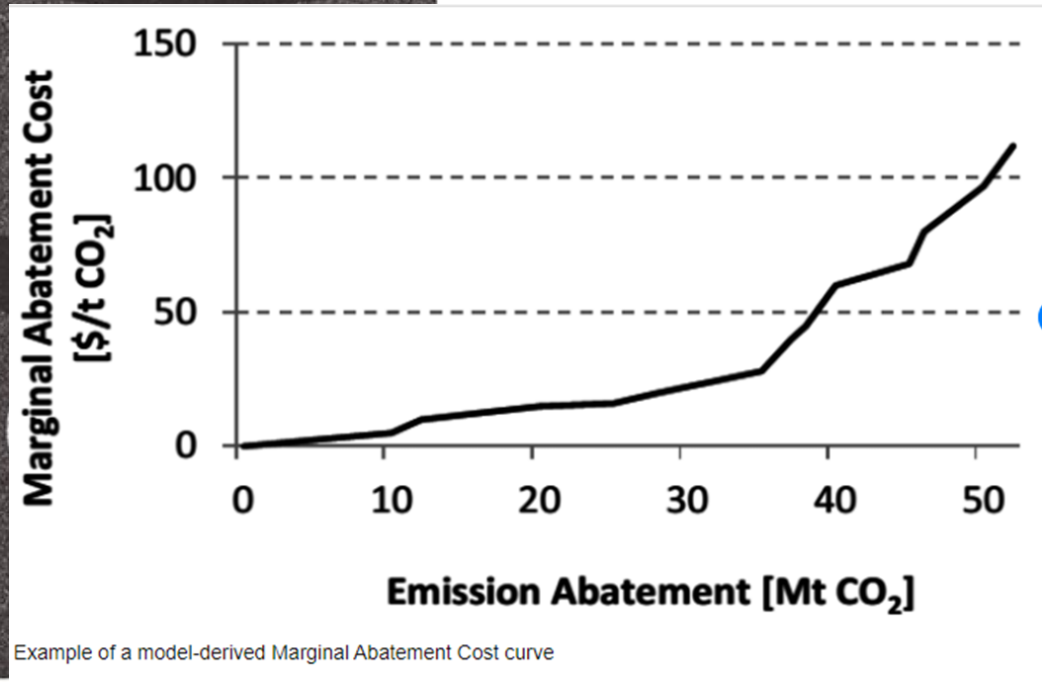


# Old paradigm of marginal abatement: decarbonisation only ever gets more difficult




Example of a model-derived Marginal Abatement Cost curve

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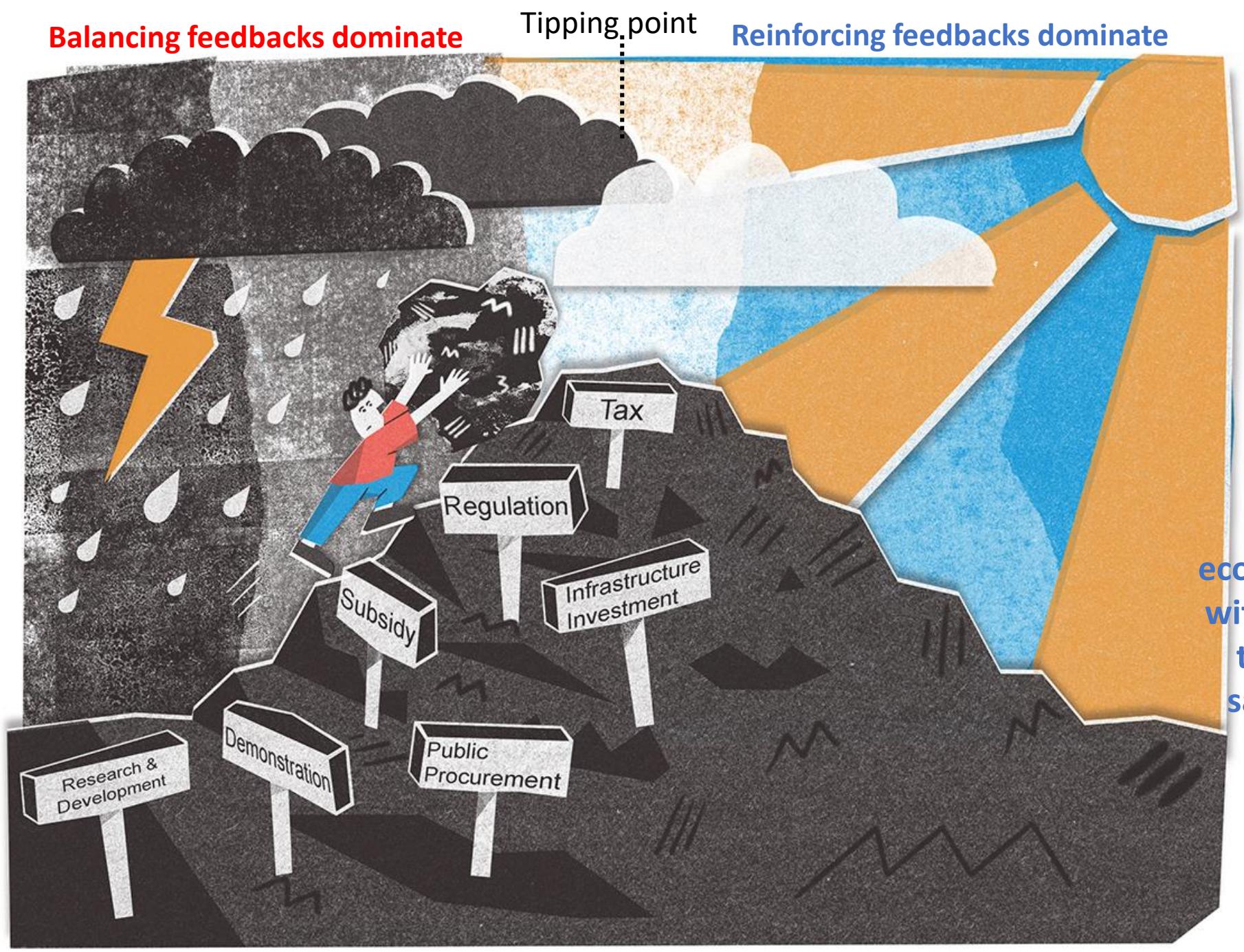
## New paradigm of a system transition

## beyond a certain point, change acquires its own momentum




**Dirty fossil economy**

**Clean economy with $12 trillion savings**

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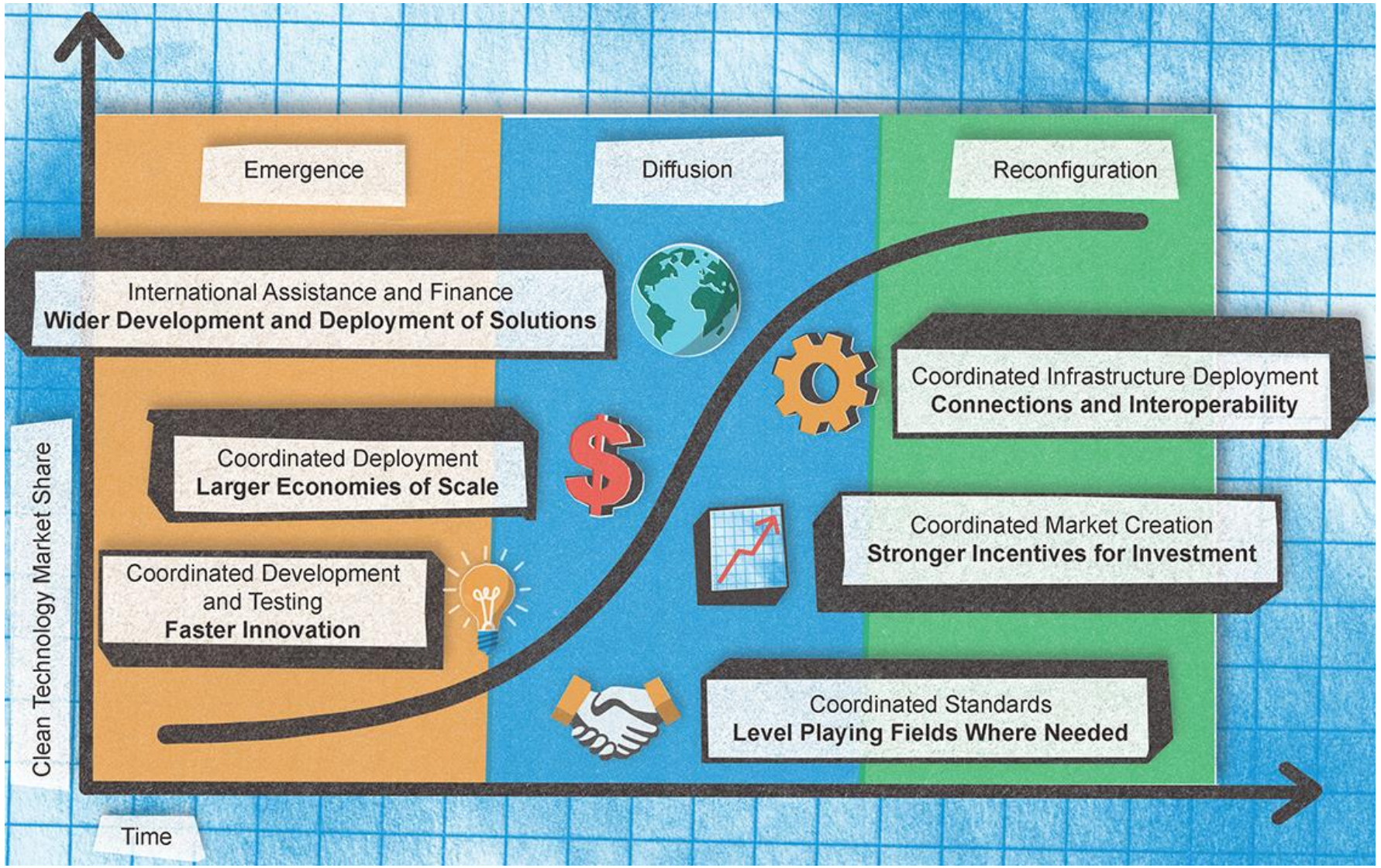
# DIPLOMACY

Negative sum diplomacy in a static economy

How to divide up the global carbon pie

# Positive sum diplomacy in a dynamic economy




Adapted from IEA, IRENA & Climate Champions, *The Breakthrough Agenda Report 2022* and Victor, Geels & Sharpe, *Accelerating the low carbon transition* (2019)

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**Aligning action internationally can supercharge the reinforcing feedbacks of the clean technology transition**


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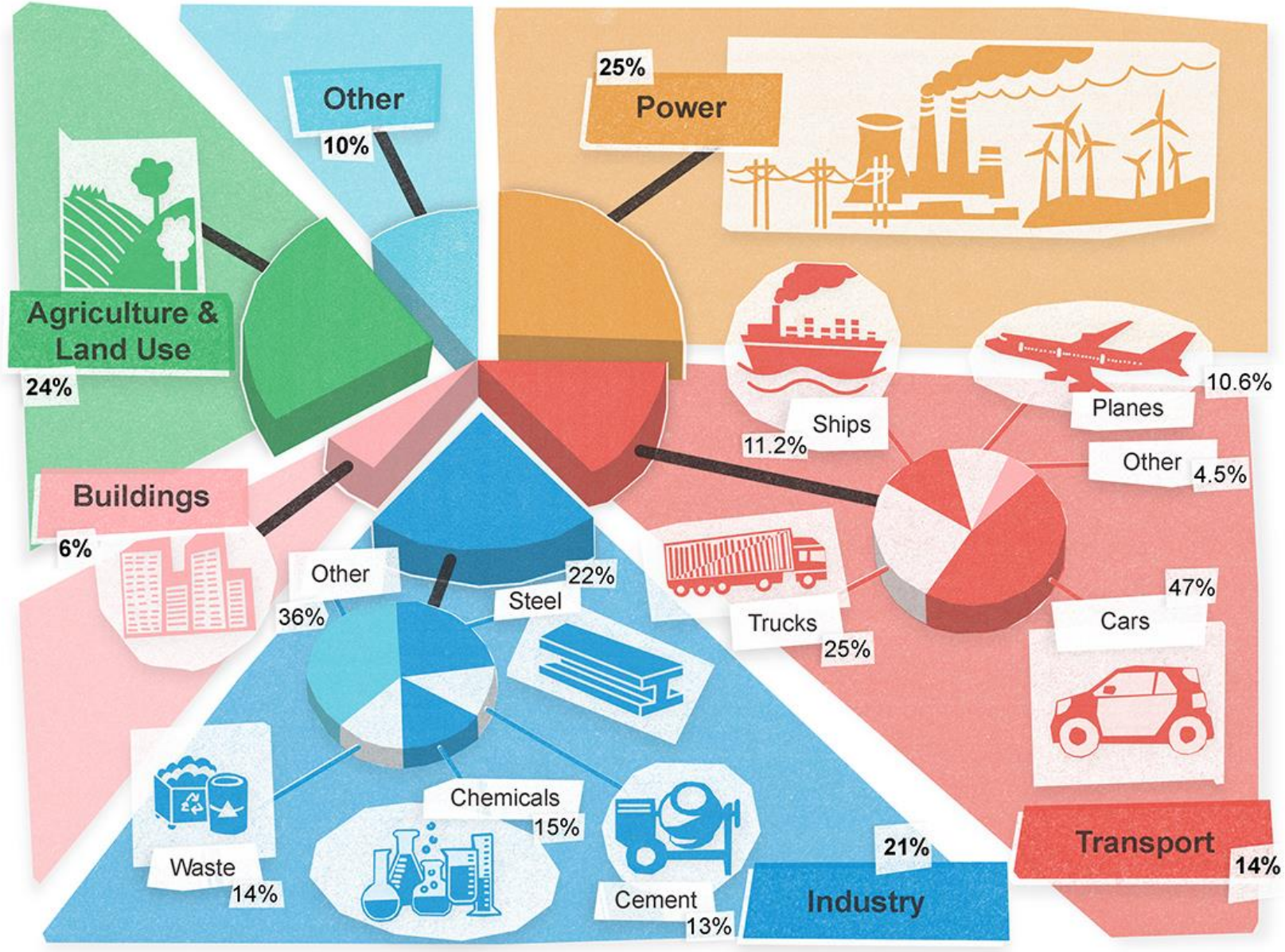
# Scope: focus cooperation within sectors

**Because each sector is different:** in its technology, political economy, industrial and financial structure, problems to solve, influential countries, the nature of its international connections, and the opportunity for diplomacy to help advance the transition

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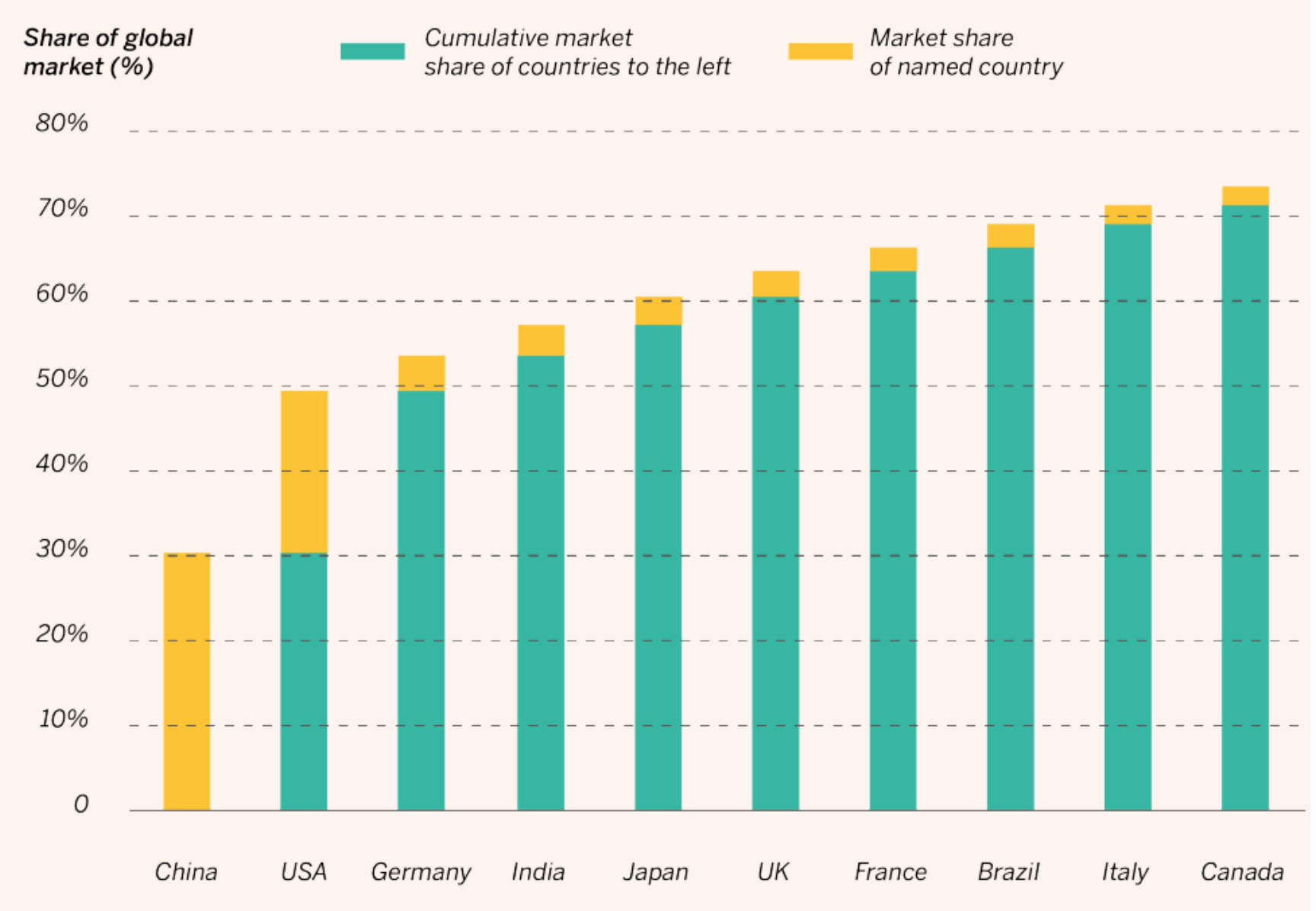
# Participation: focus on a critical mass of actors

**Cumulative share of global car sales**

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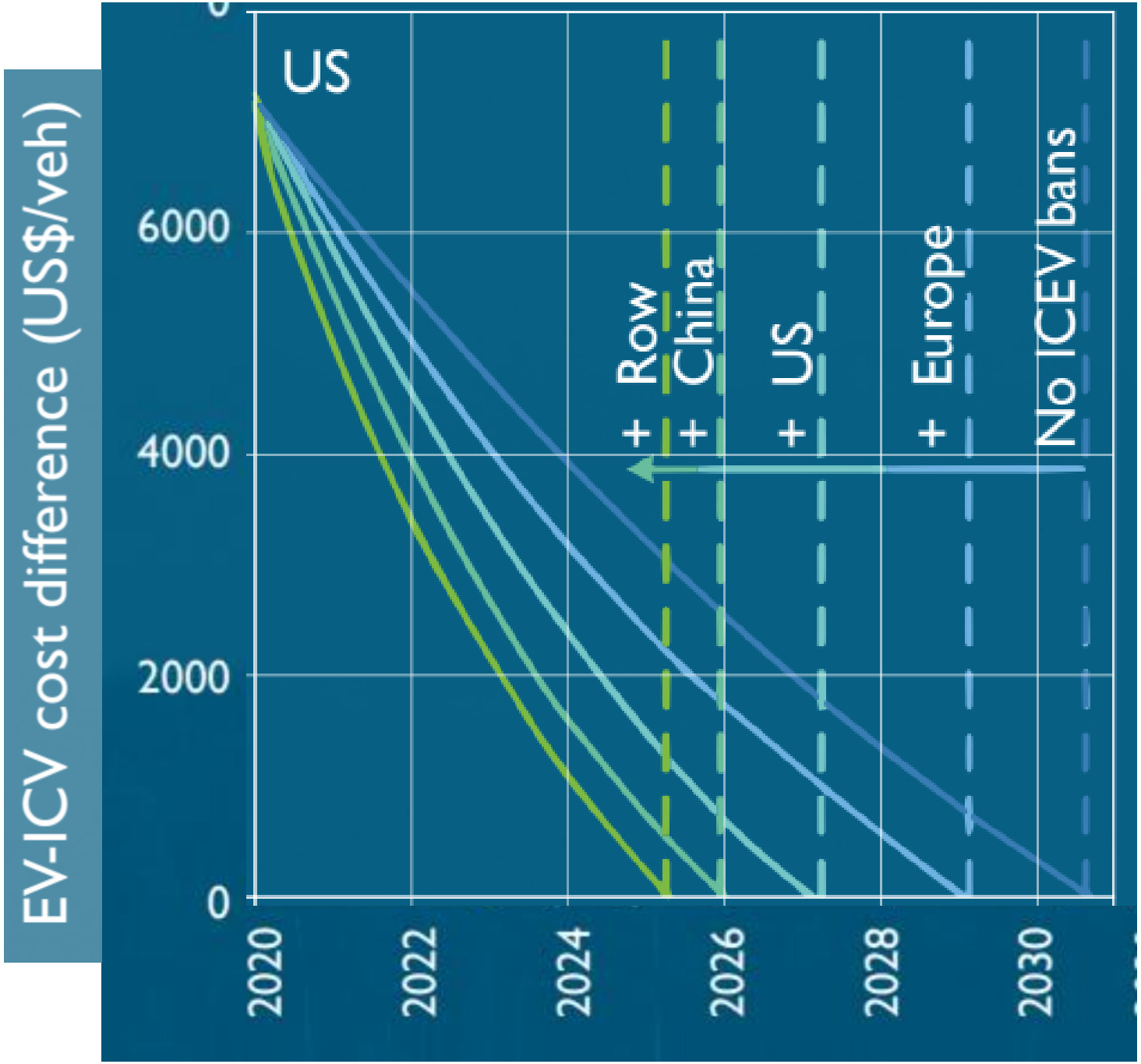
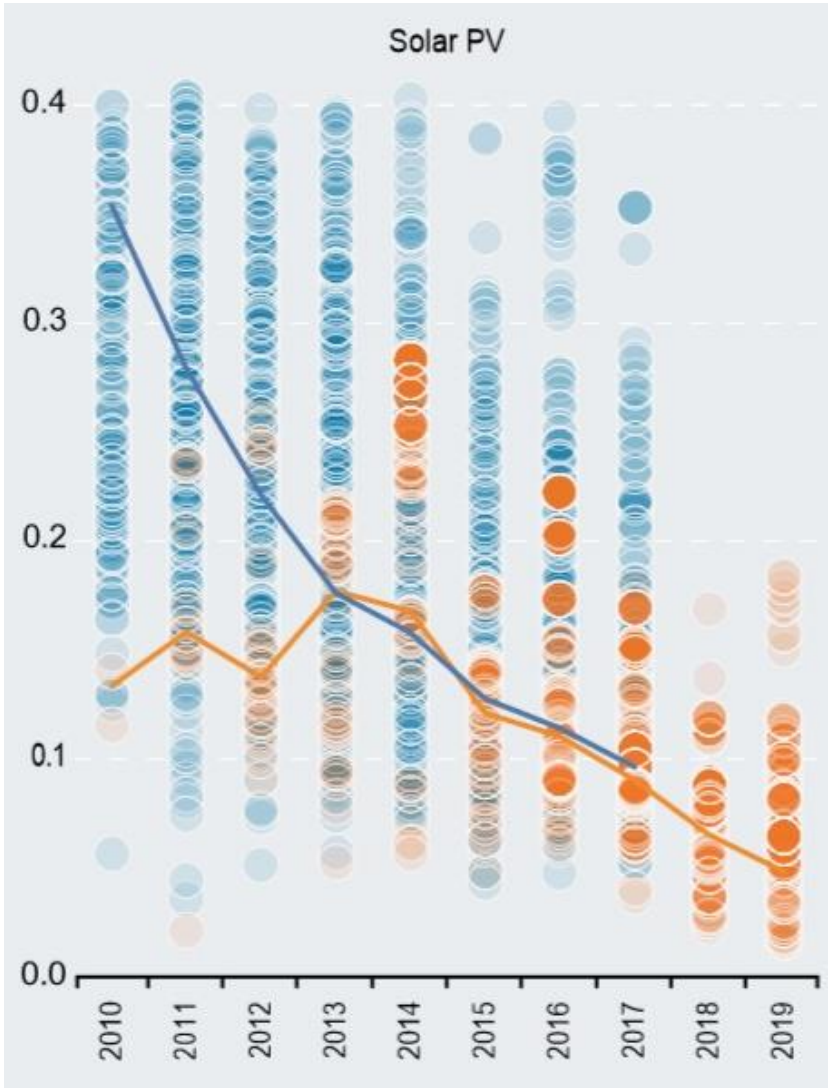
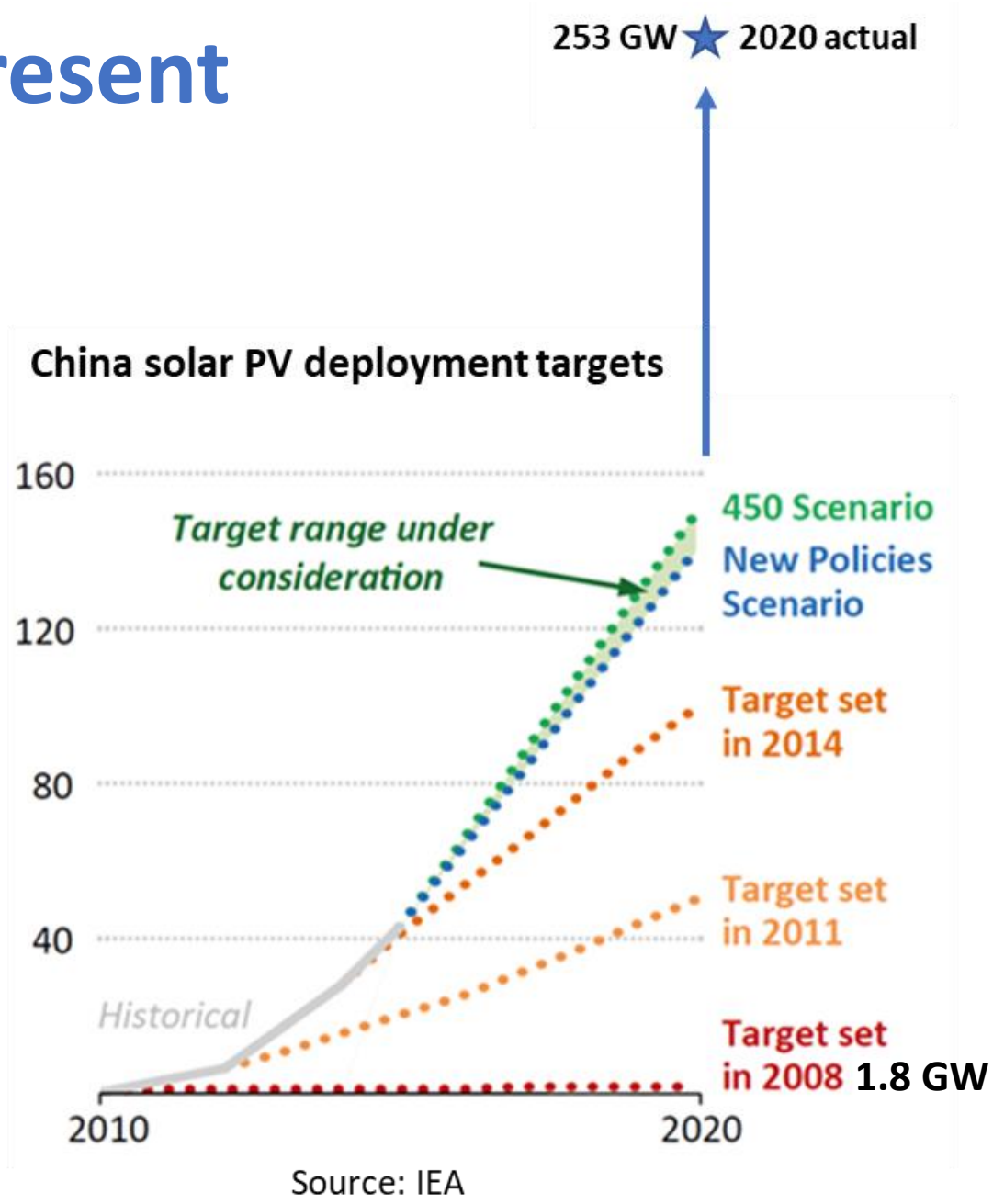
# Three regulators can bring forward the electric vehicle tipping point by up to 5 years




Source: Lam & Mercure, *'Evidence for a global electric vehicle tipping point'* (2022)

# Timescale: focus on the present

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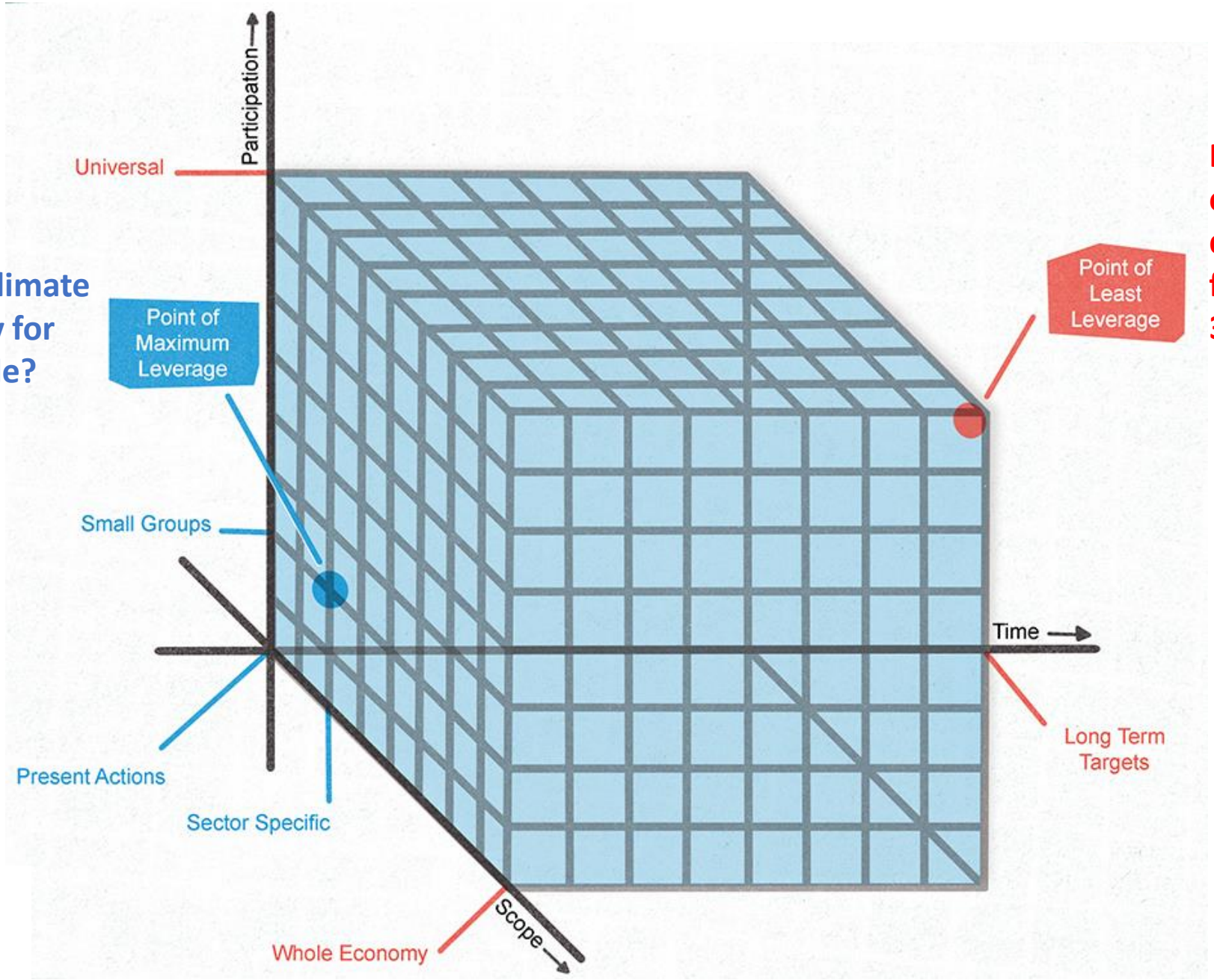
**Focus of climate diplomacy for this decade?**




**Focus of climate diplomacy for the last 30 years**

*Five Times Faster: Rethinking the Science, Economics, and Diplomacy of Climate Change.* Simon Sharpe, 2023. Info at fivetimesfaster.org

# The Breakthrough Agenda: *We will work together 'to make clean technologies and sustainable solutions the most affordable, accessible and attractive option in each emitting sector globally before 2030'*

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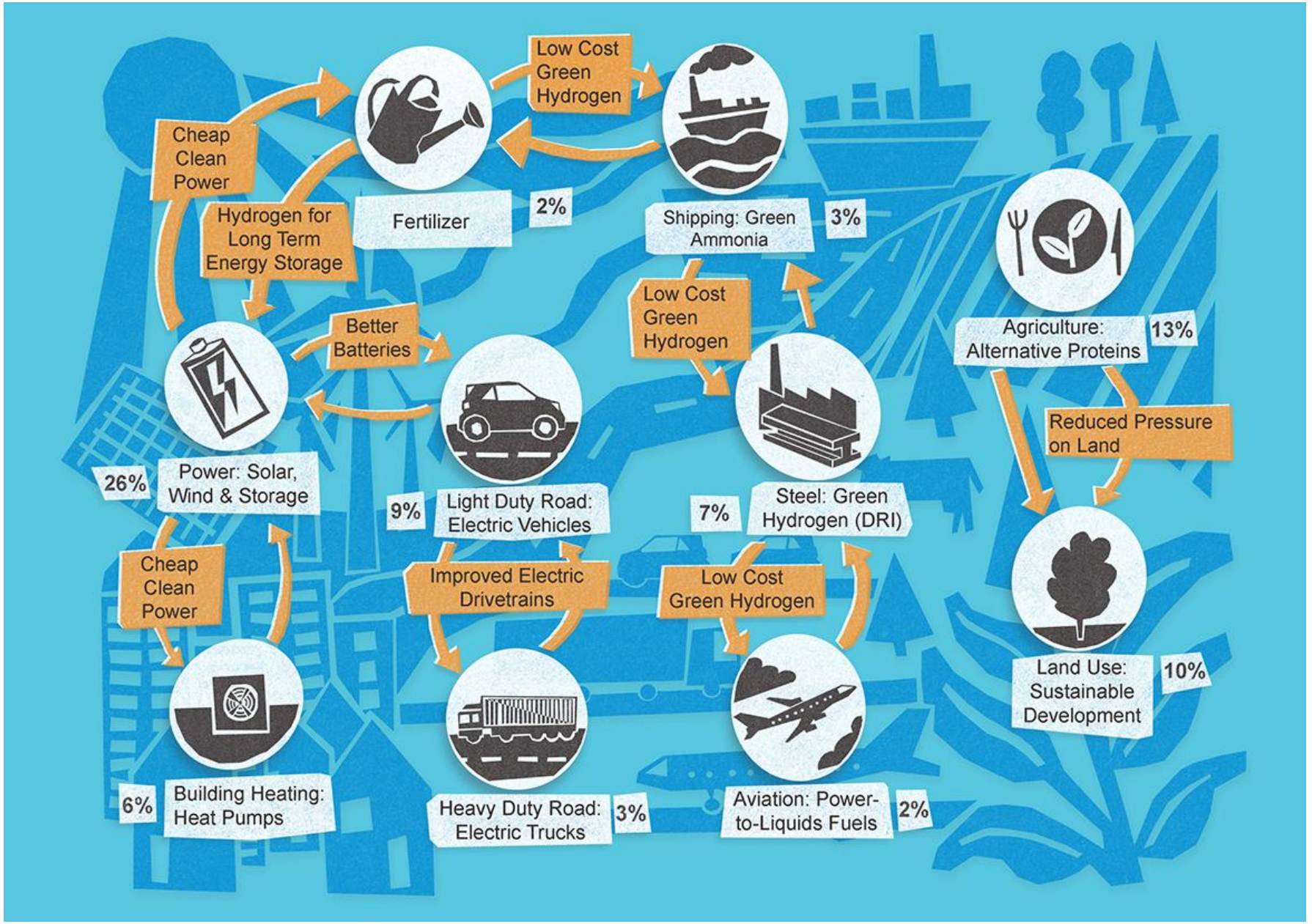
# Each positive tipping point we pass increases the chances of activating others




Adapted from Meldrum, Sharpe, Lenton, et al, *'The Breakthrough Effect'* (2023)

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**It’s not about your carbon footprint**

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## It’s about your point of leverage:
## What can you do, better than most can do, to bring about system change?

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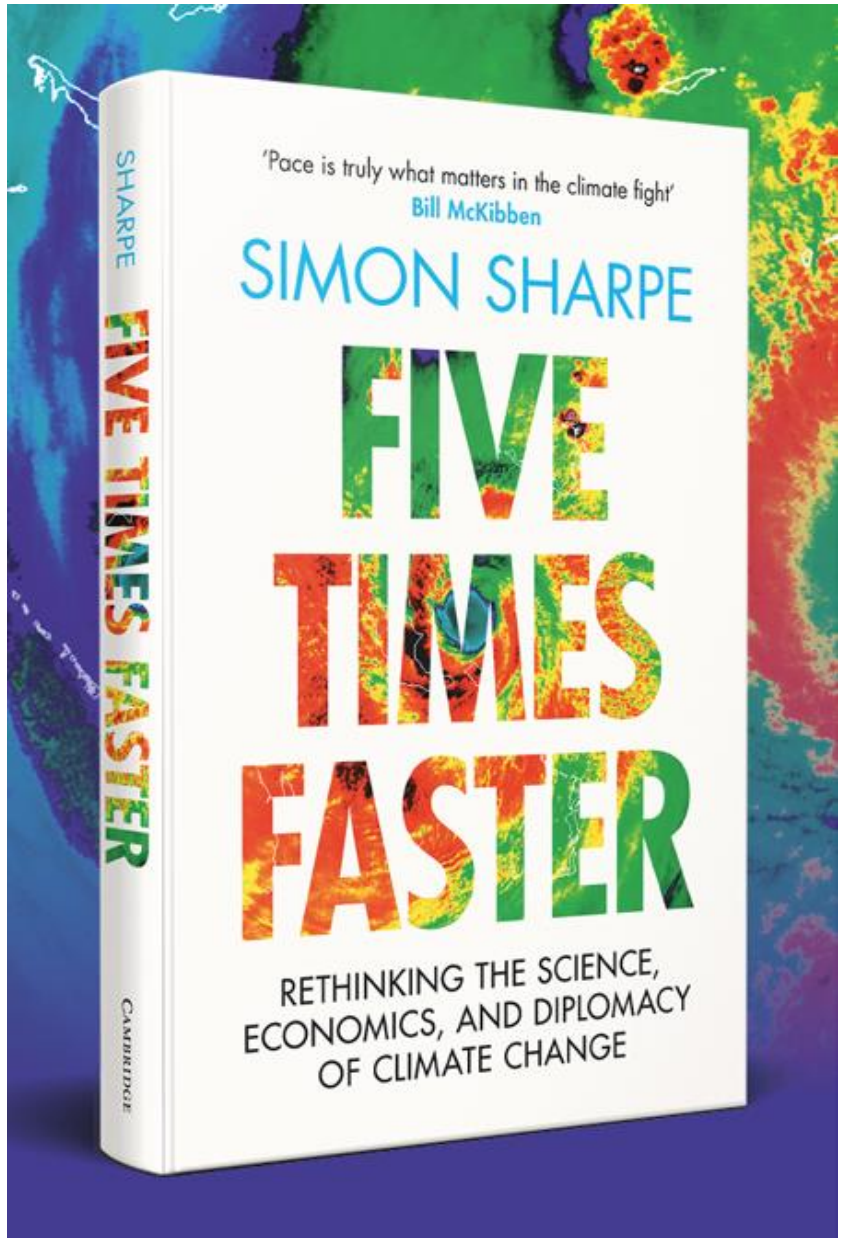


Sources, blogs, events and other info at **fivetimesfaster.org**

Thank you