

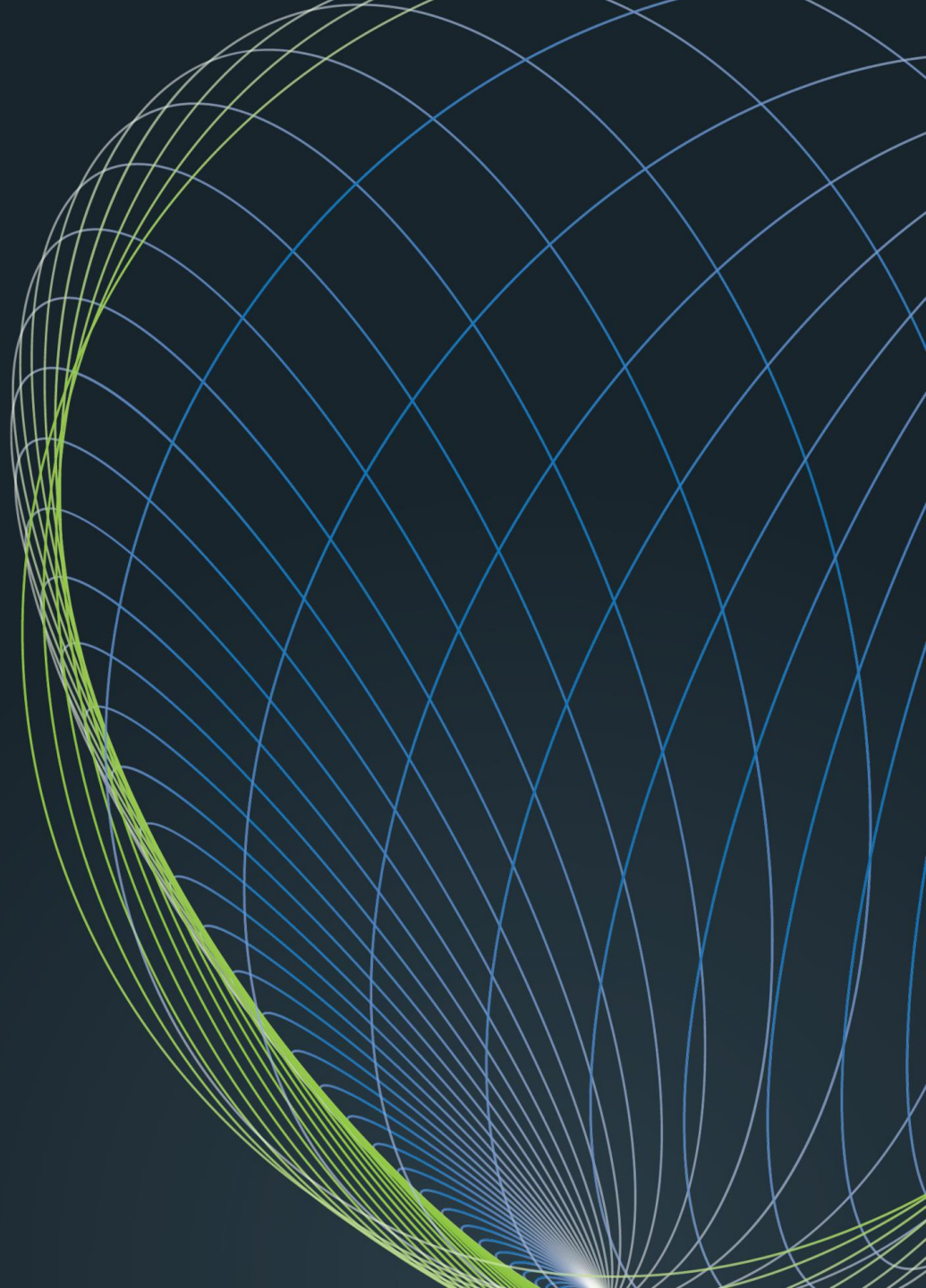
Positive tipping points to avoid climate tipping points

Tim Lenton

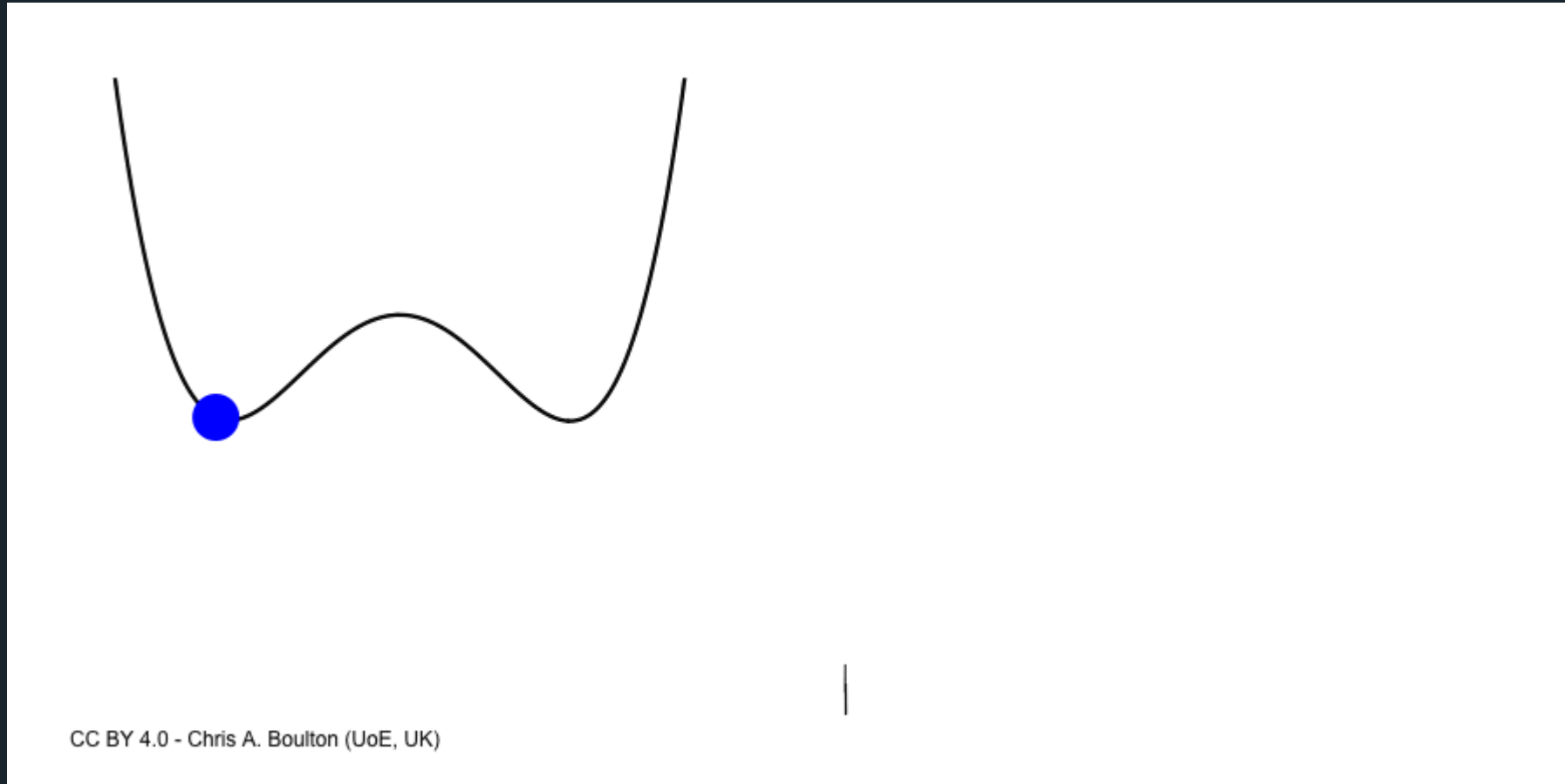
Chair in Climate Change, University of Exeter

t.m.lenton@exeter.ac.uk

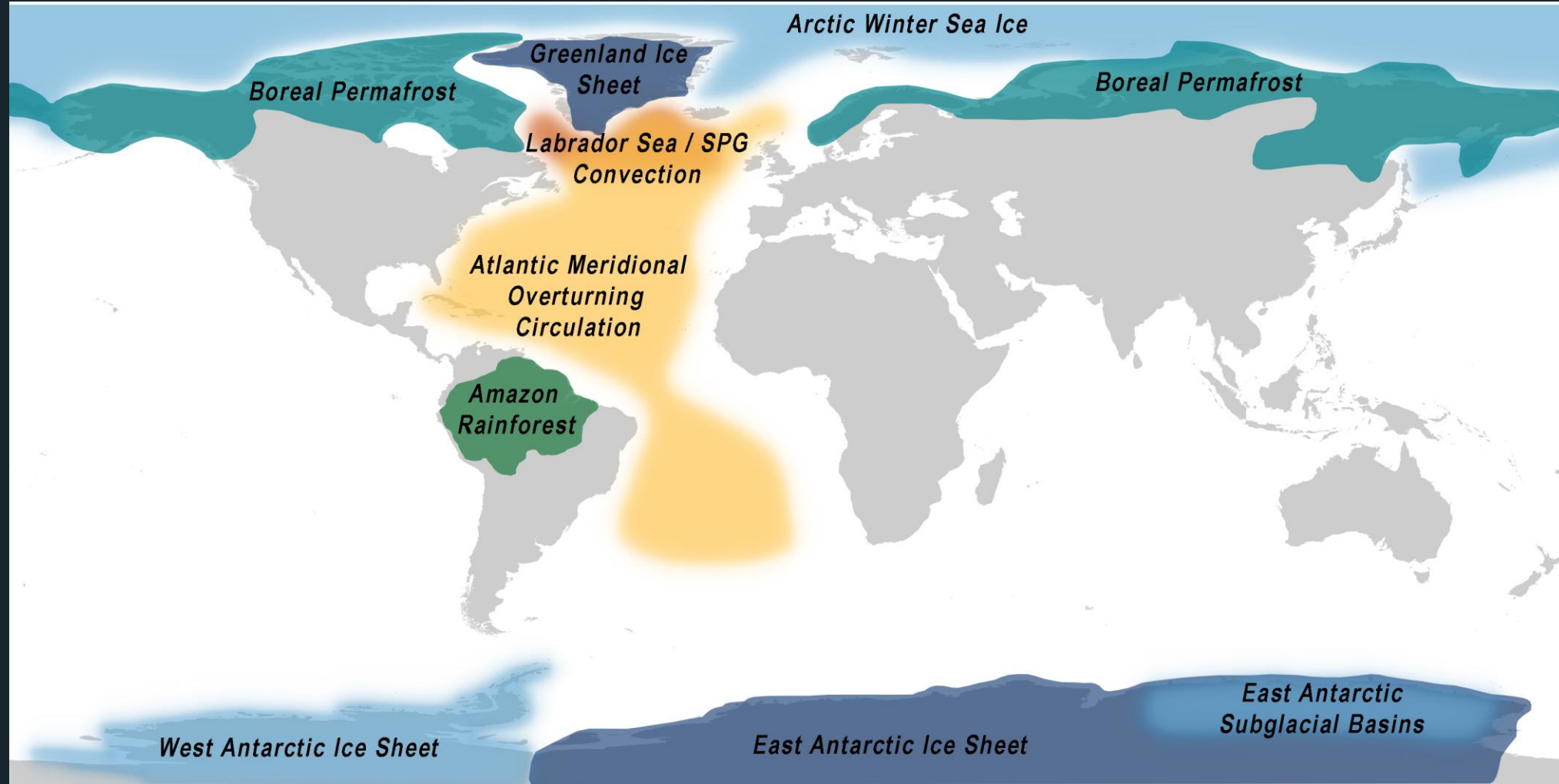
exeter.ac.uk/gsi



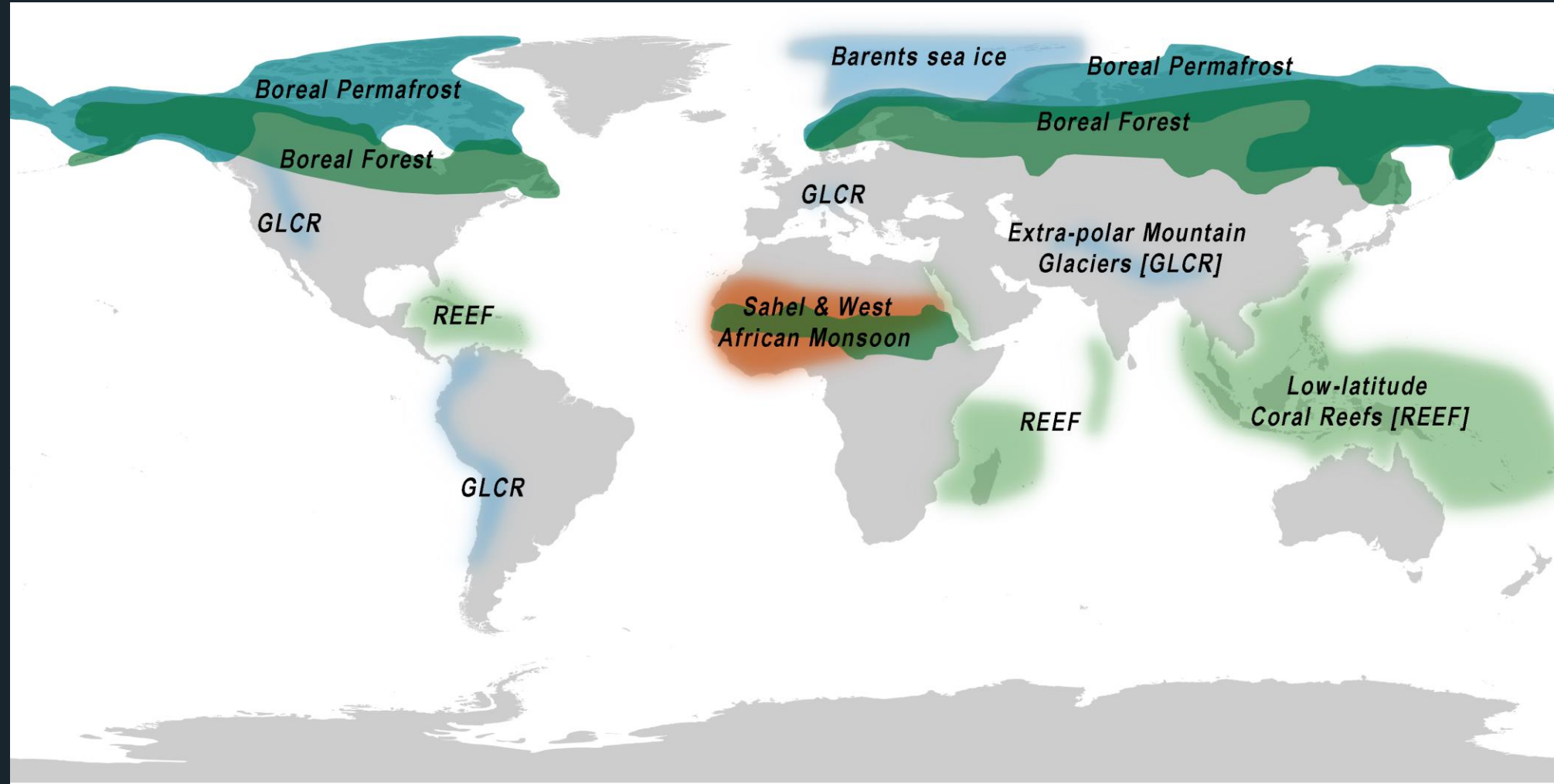
Generic example of passing a tipping point

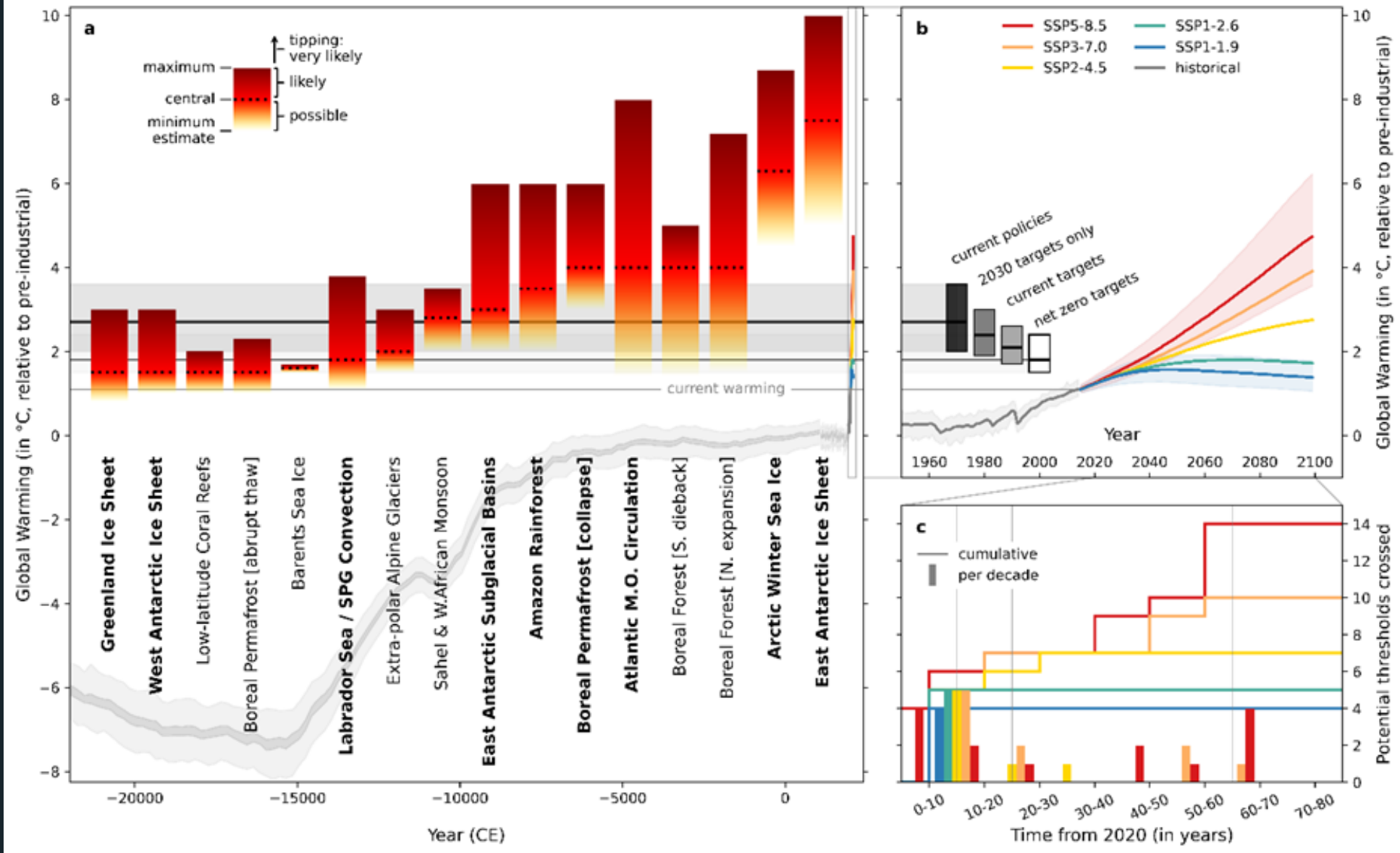


Global 'core' climate tipping elements

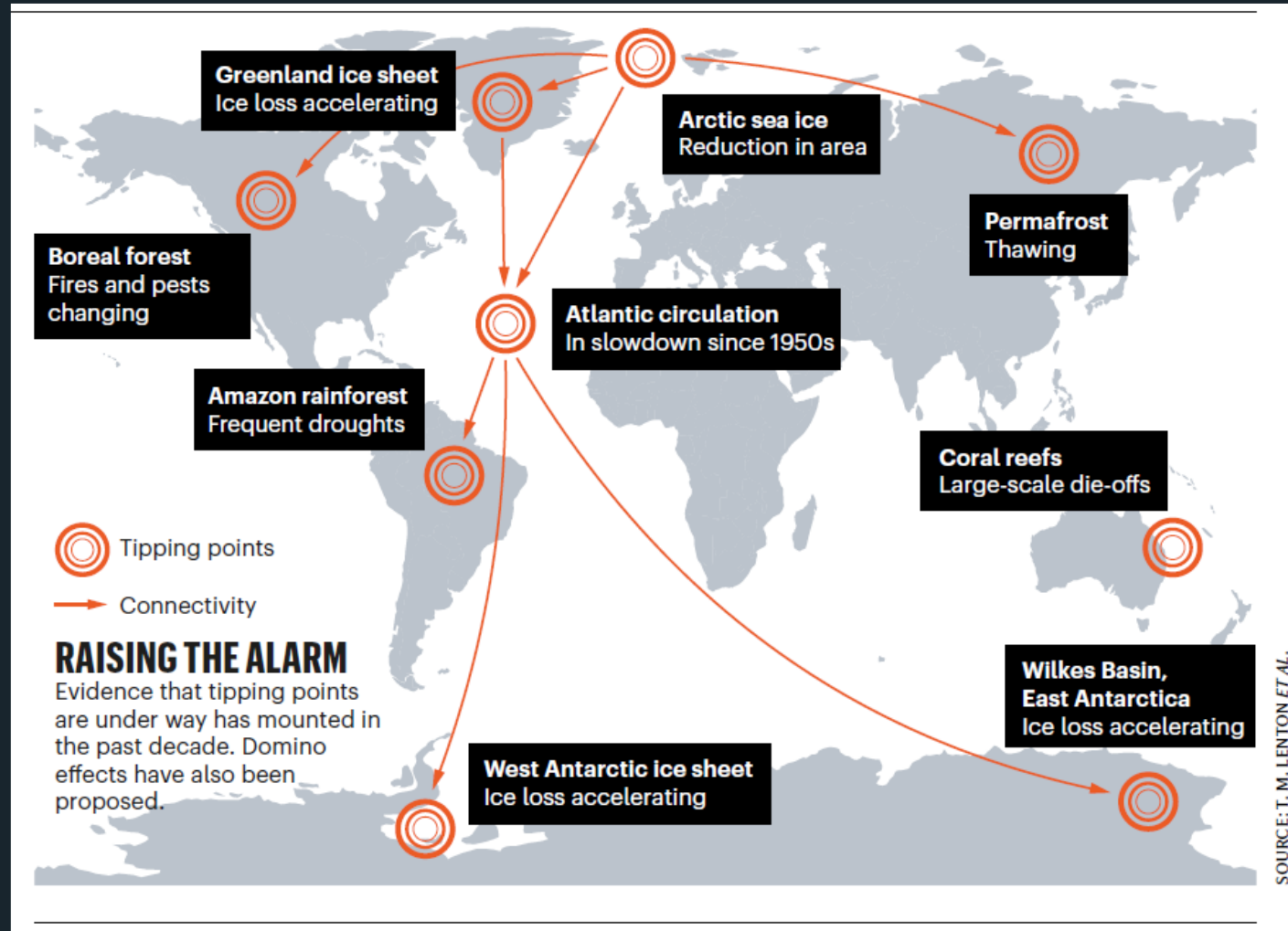


Regional 'impact' climate tipping elements



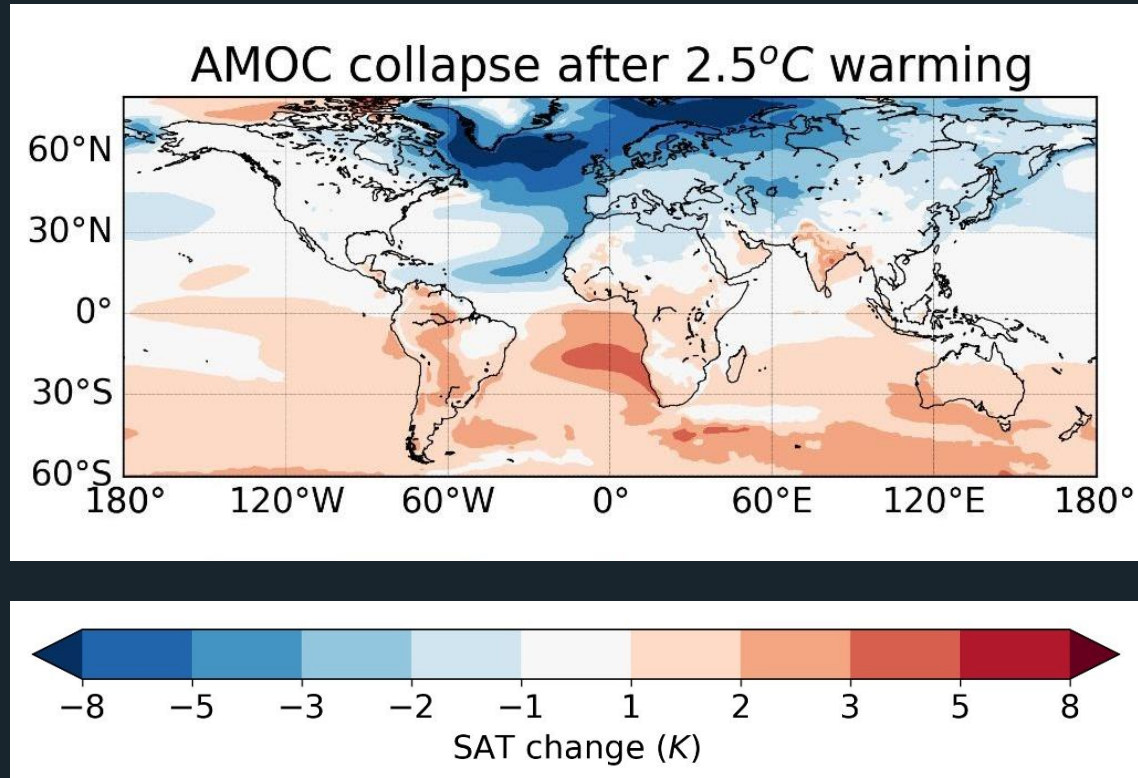


Coupling between tipping elements

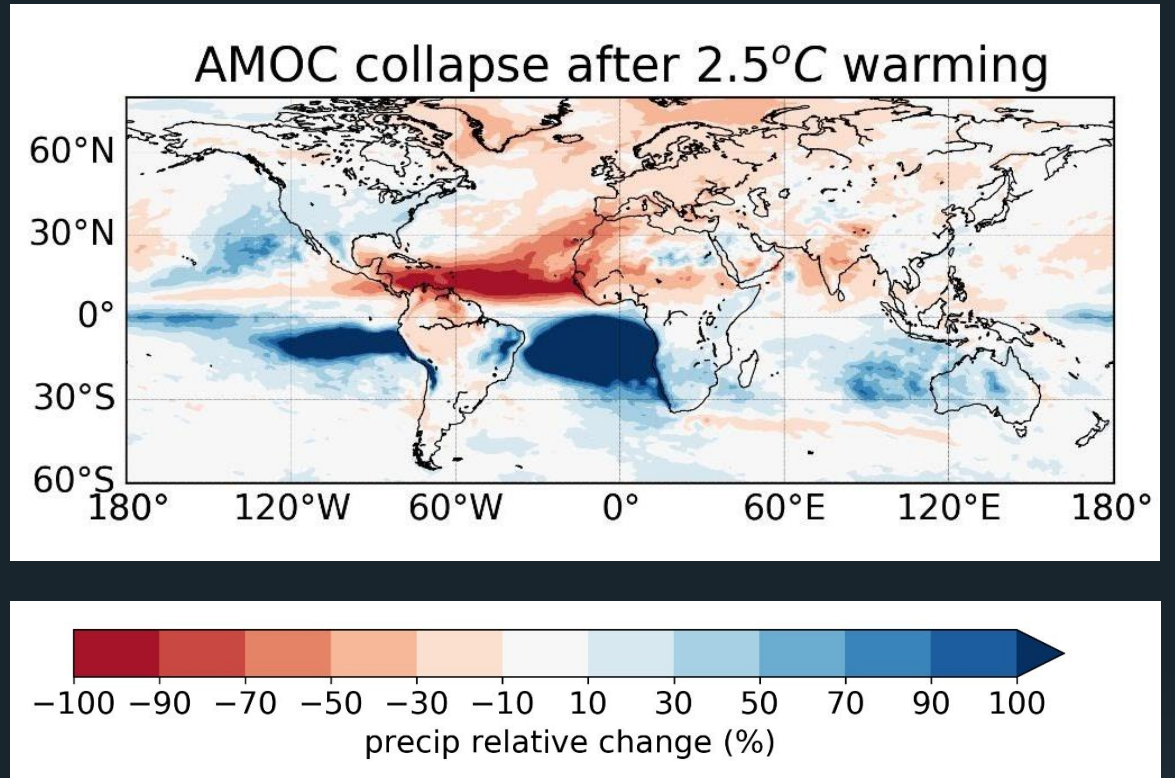


Impacts of global warming + AMOC tipping point

Temperature change



Precipitation change

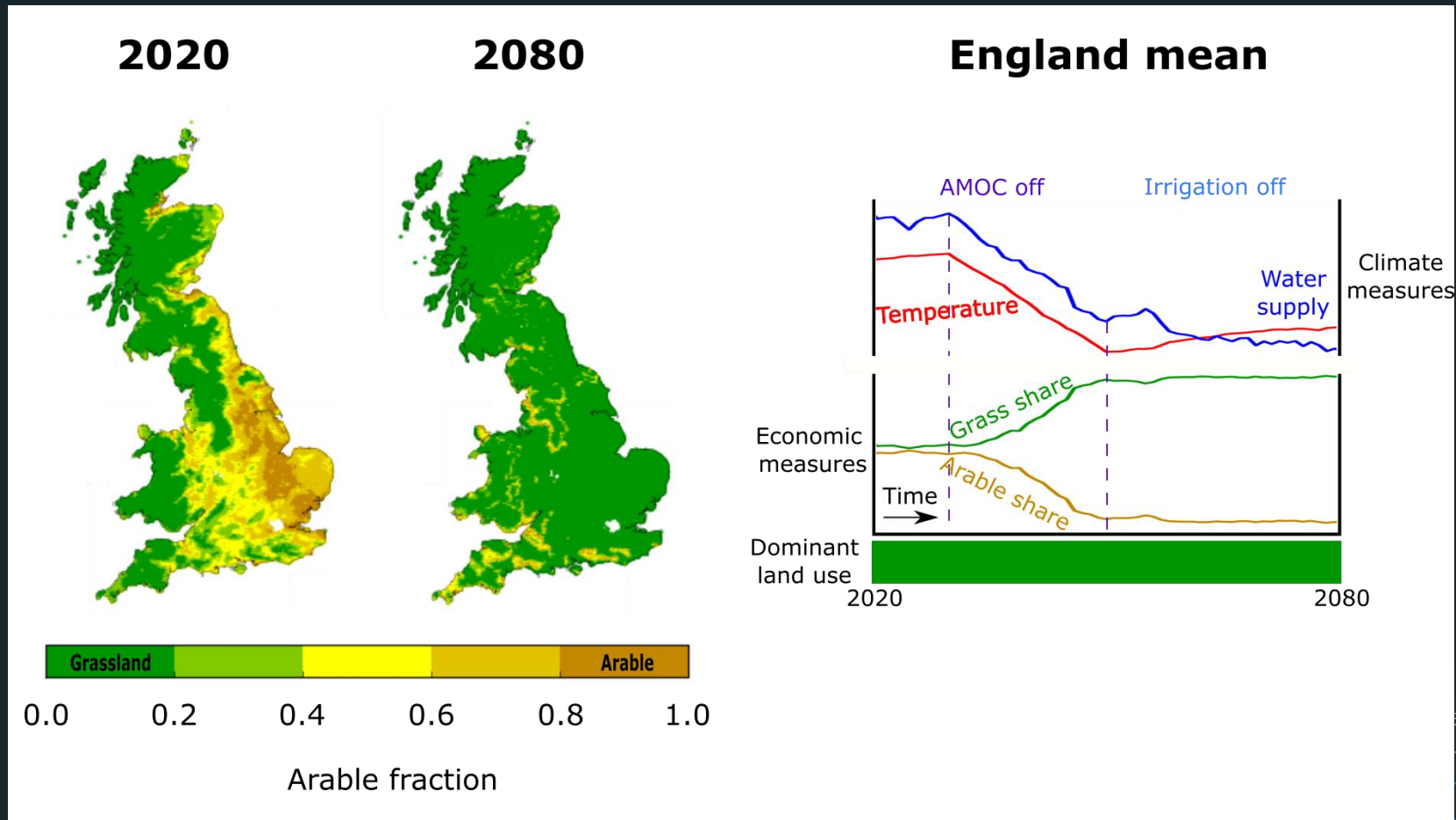


HadGEM3 GC2 model



Impacts of global warming + AMOC tipping point

Econometric ('NEV') Model of UK Agriculture driven by climate model output

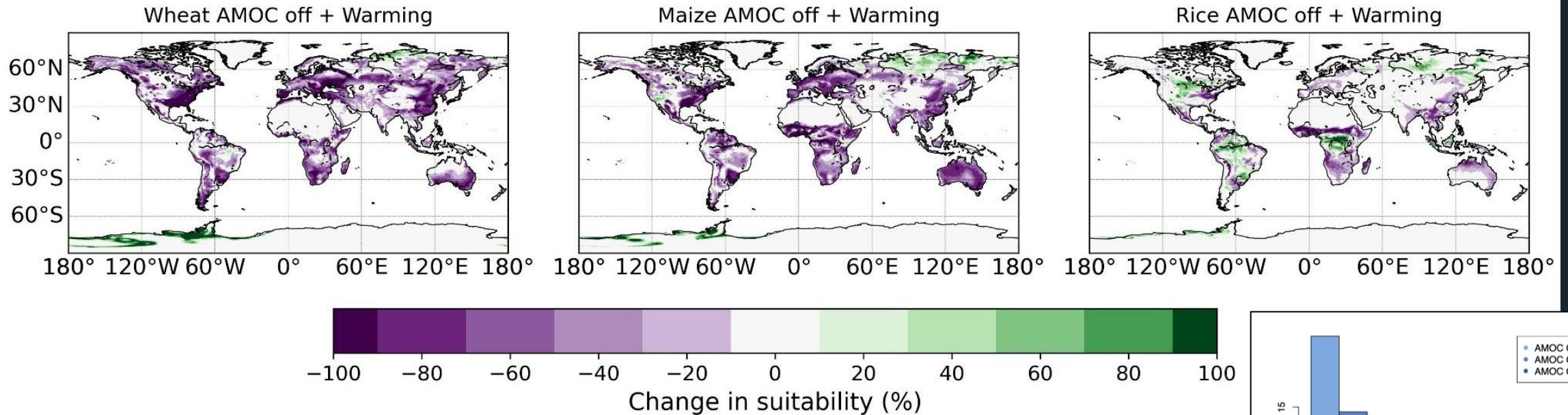


Change in suitability for growing staple crops

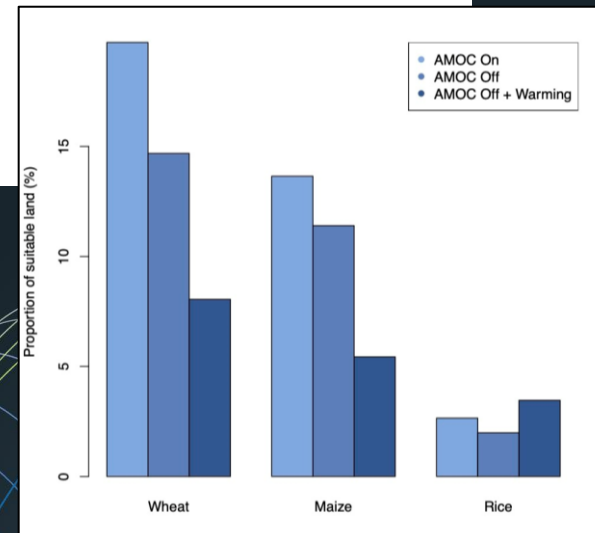
Wheat

Maize

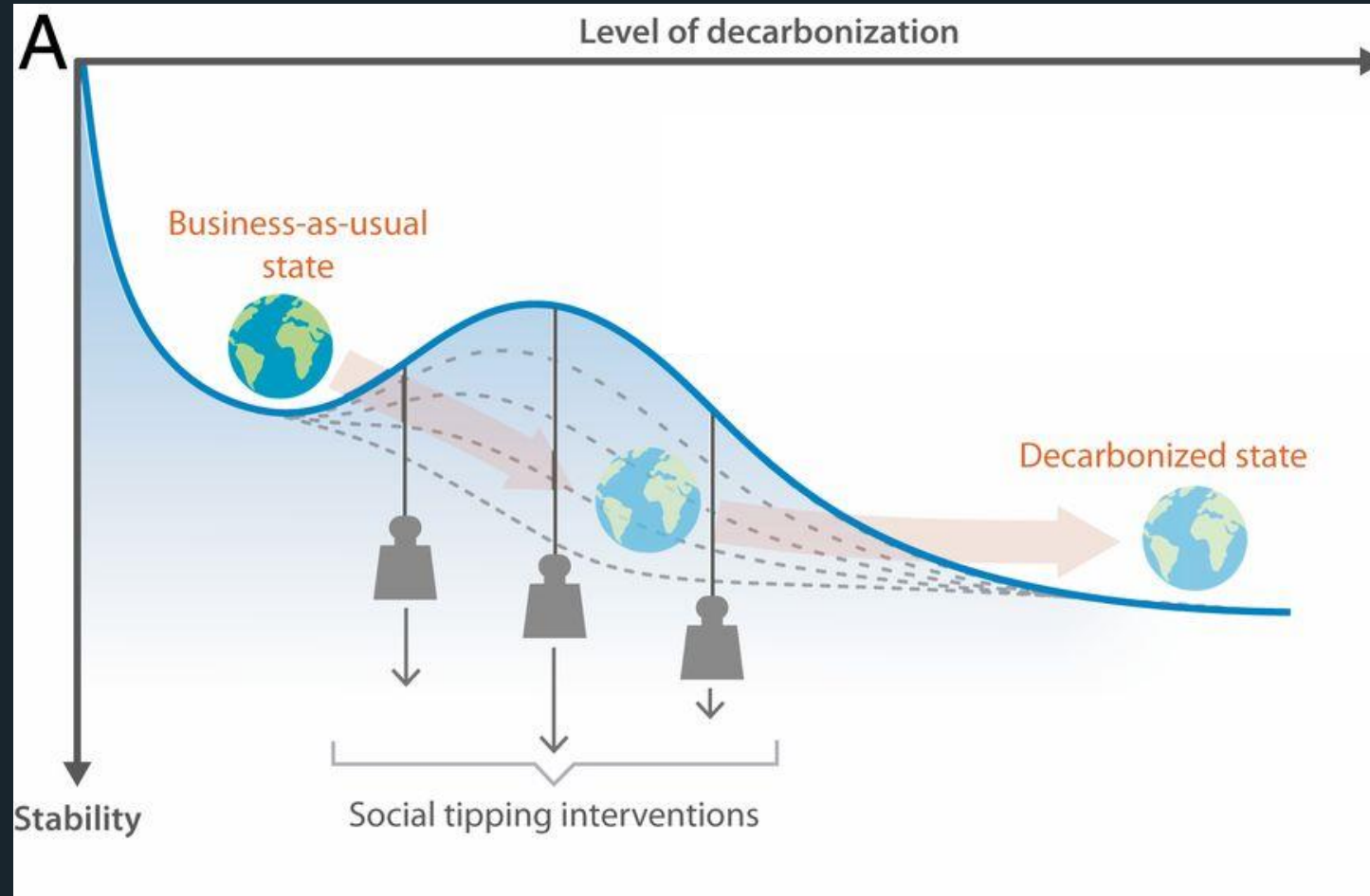
Rice



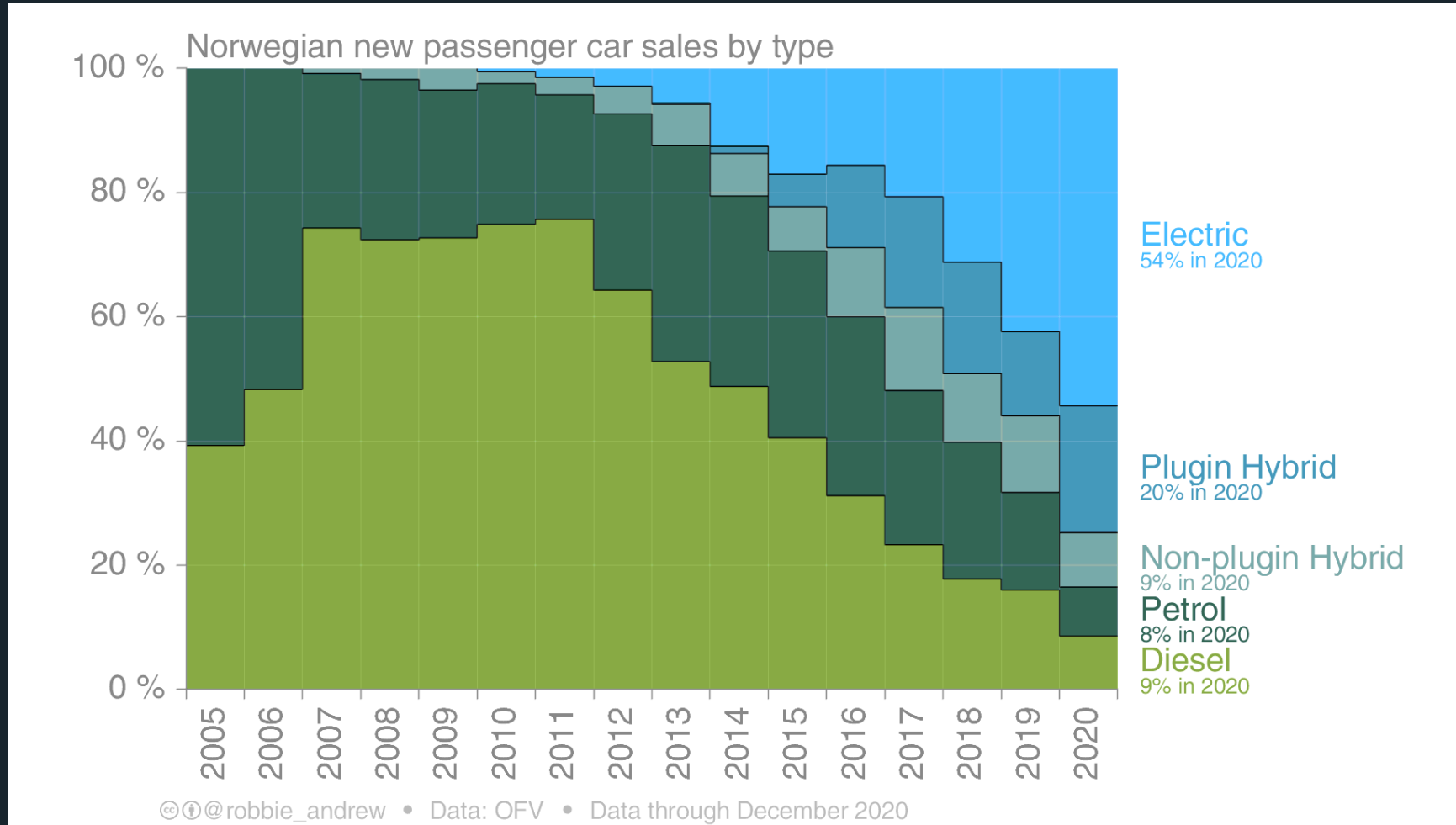
Using ECOCROP data on optimal temperature, precipitation and growing season length



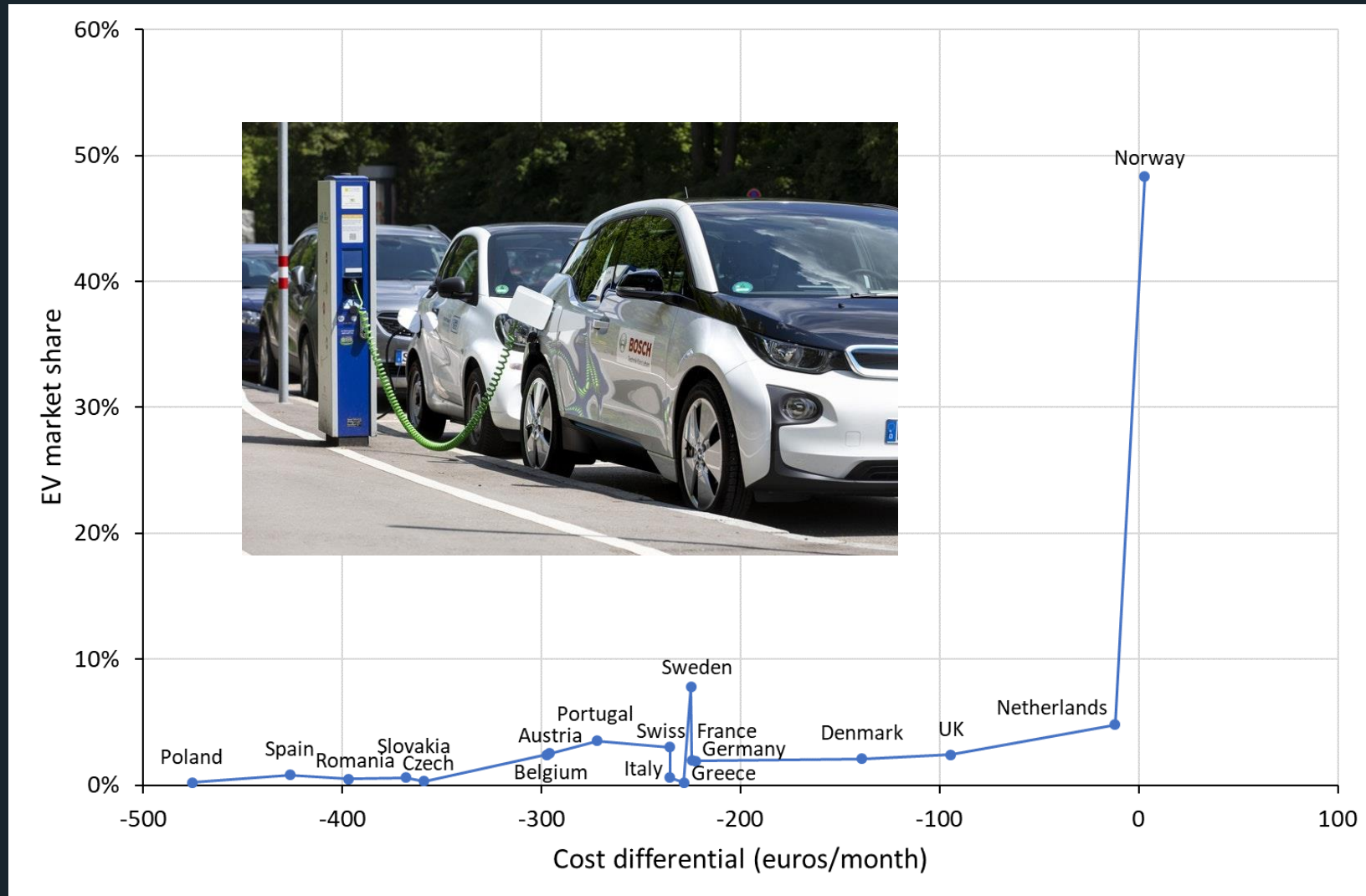
Tipping positive change



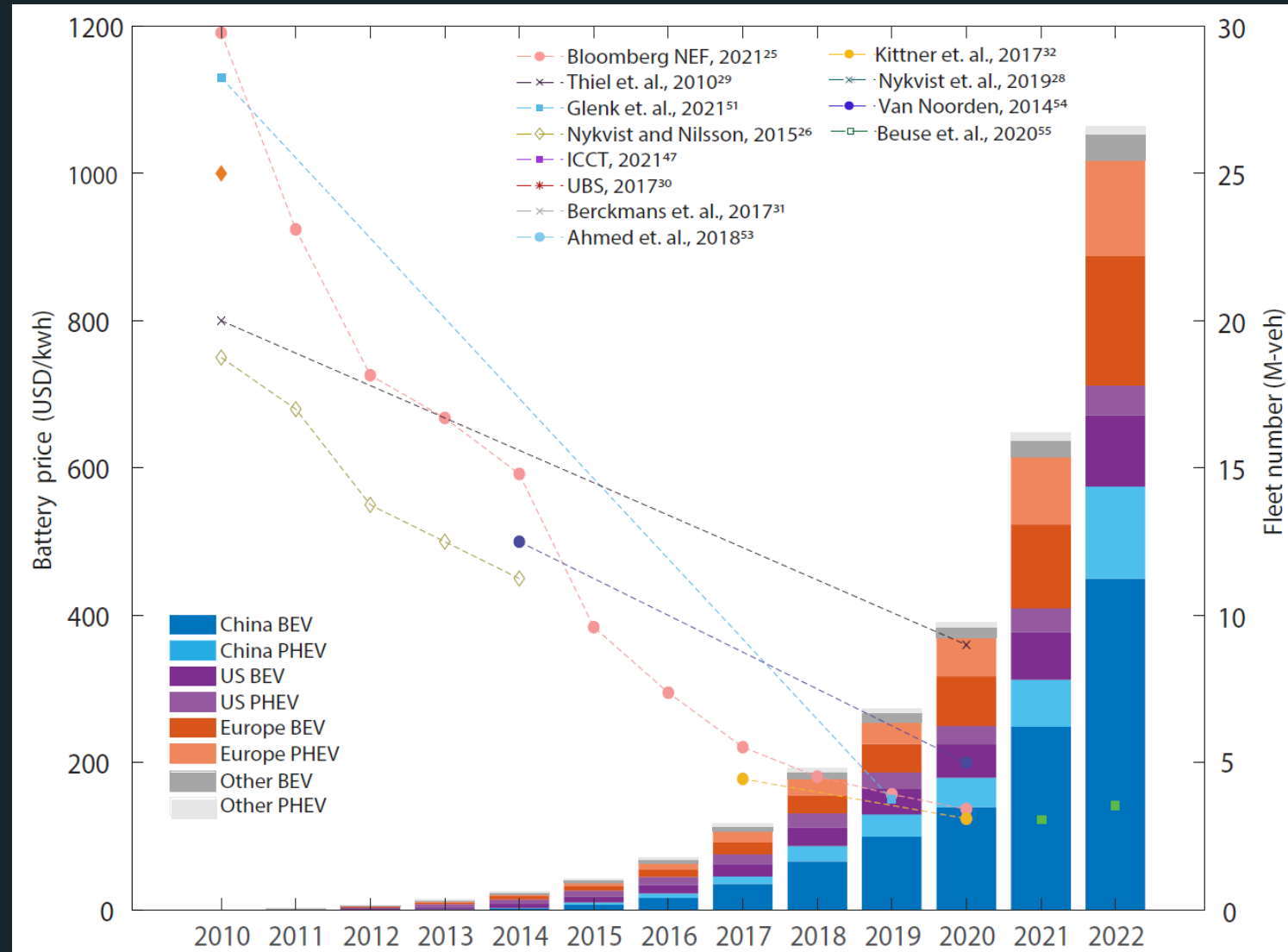
Tipping petrol/diesel cars out of Norway's market



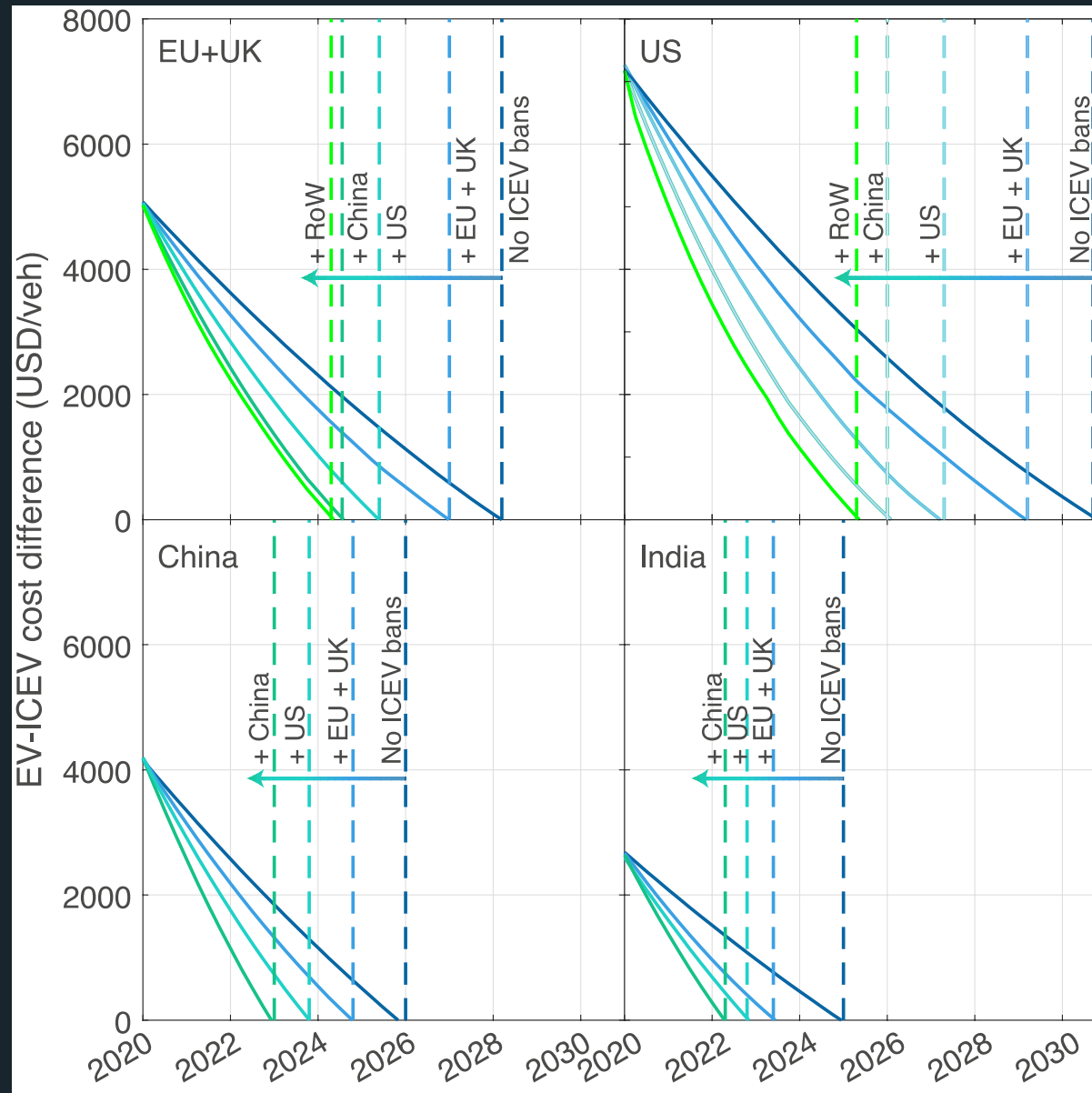
EV market share as a function of cost difference to petrol/diesel car

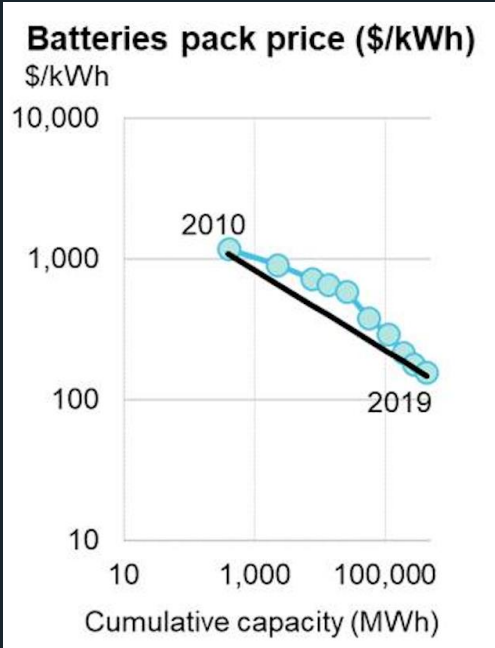


Battery price and global EV fleet size over time



ICEV sales bans
bring forward
EV price parity
elsewhere in
the world





Electric vehicles cheaper than petrol cars in major economies

EV & battery deployment up; costs down

EV cars cheaper than petrol cars in many markets

Petrol cars still cheaper

EV light trucks cheaper than diesel

Diesel trucks still cheaper

Renewables + battery storage cheaper than coal power

Coal still cheaper

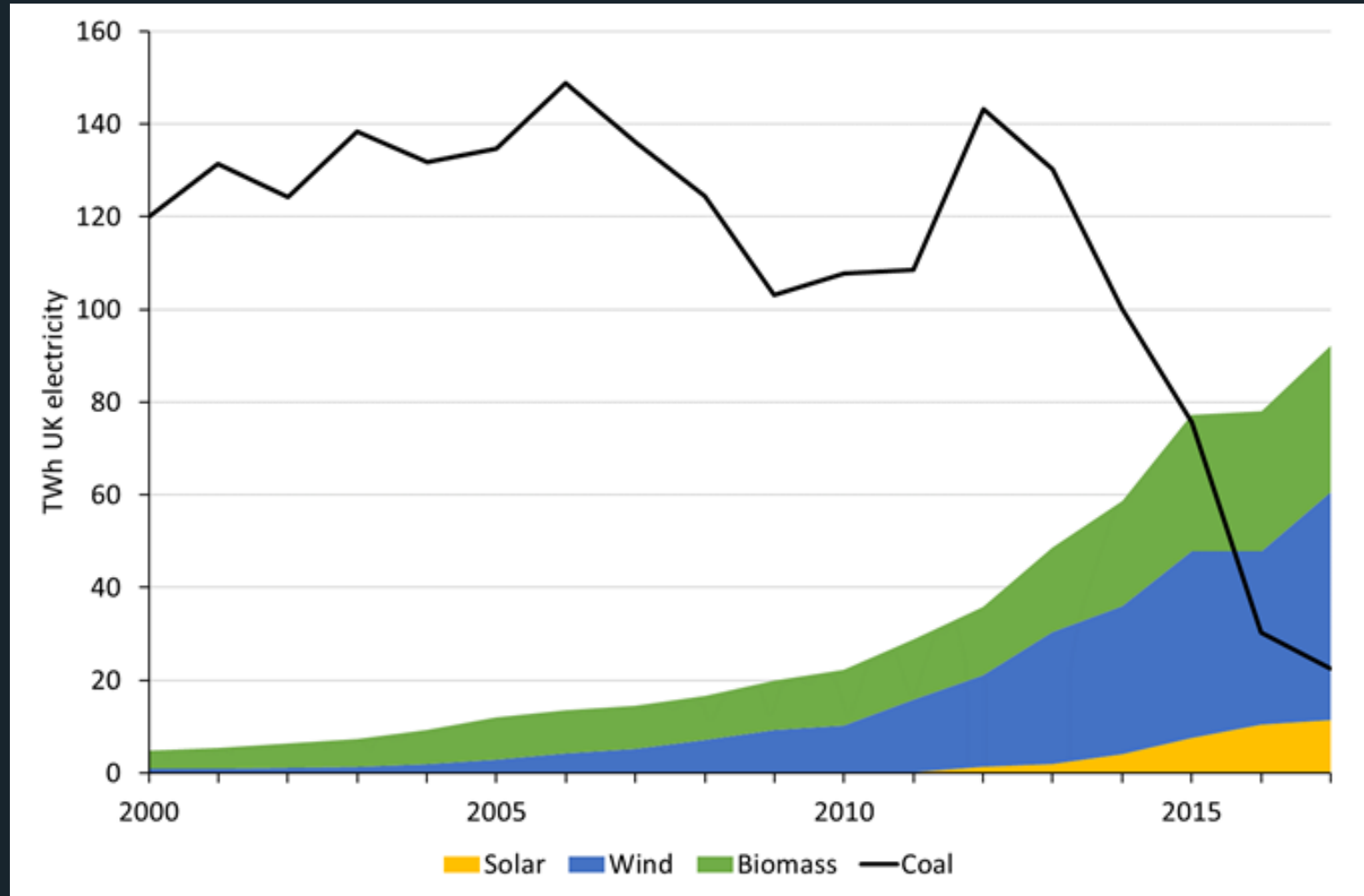
Oil firms commit fully to diversifying investments

Oil firms still hedging their bets

Electric vehicle support policies in major economies

Petrol cars cheaper than electric vehicles

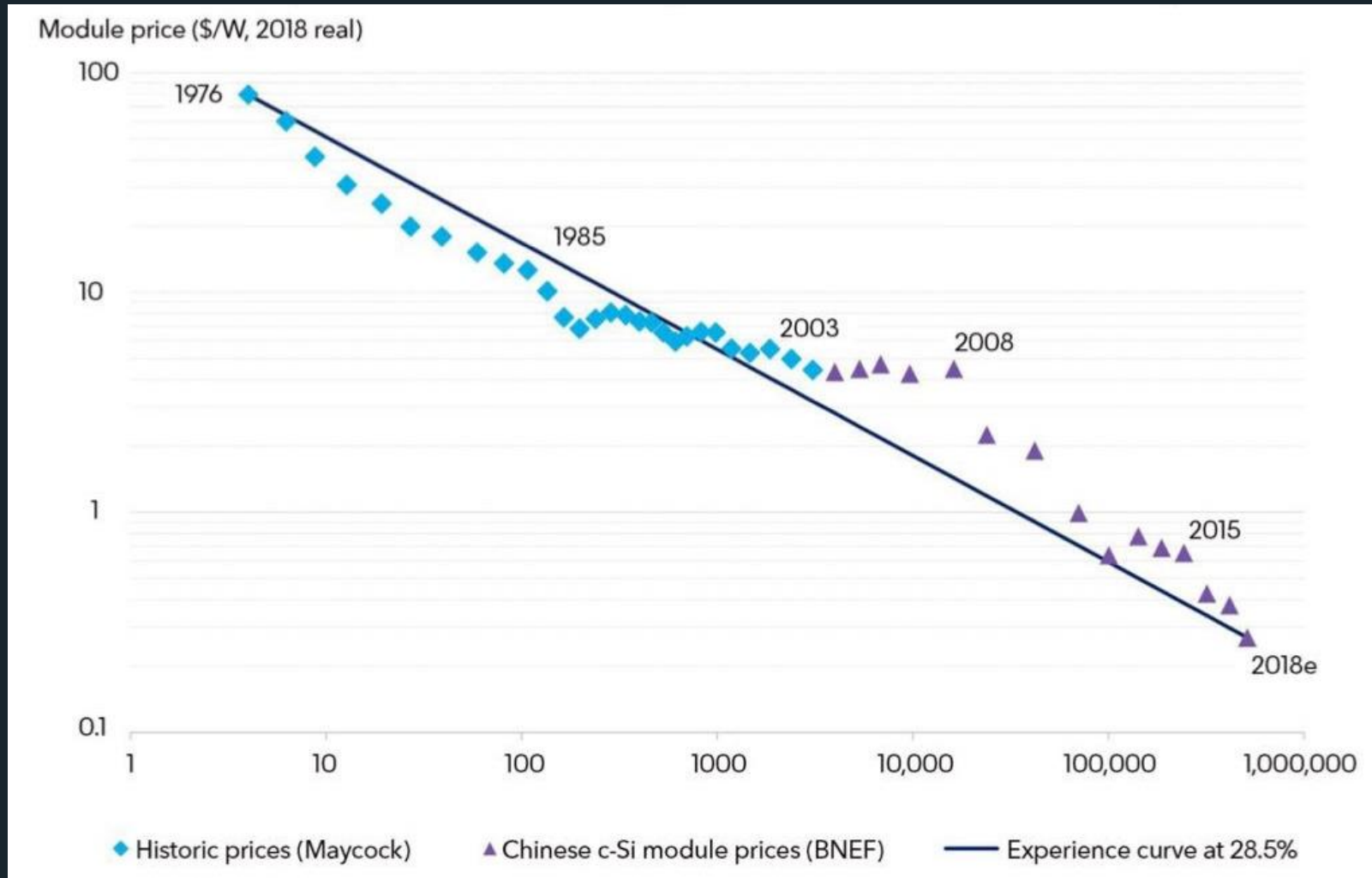
Tipping coal out of UK power generation

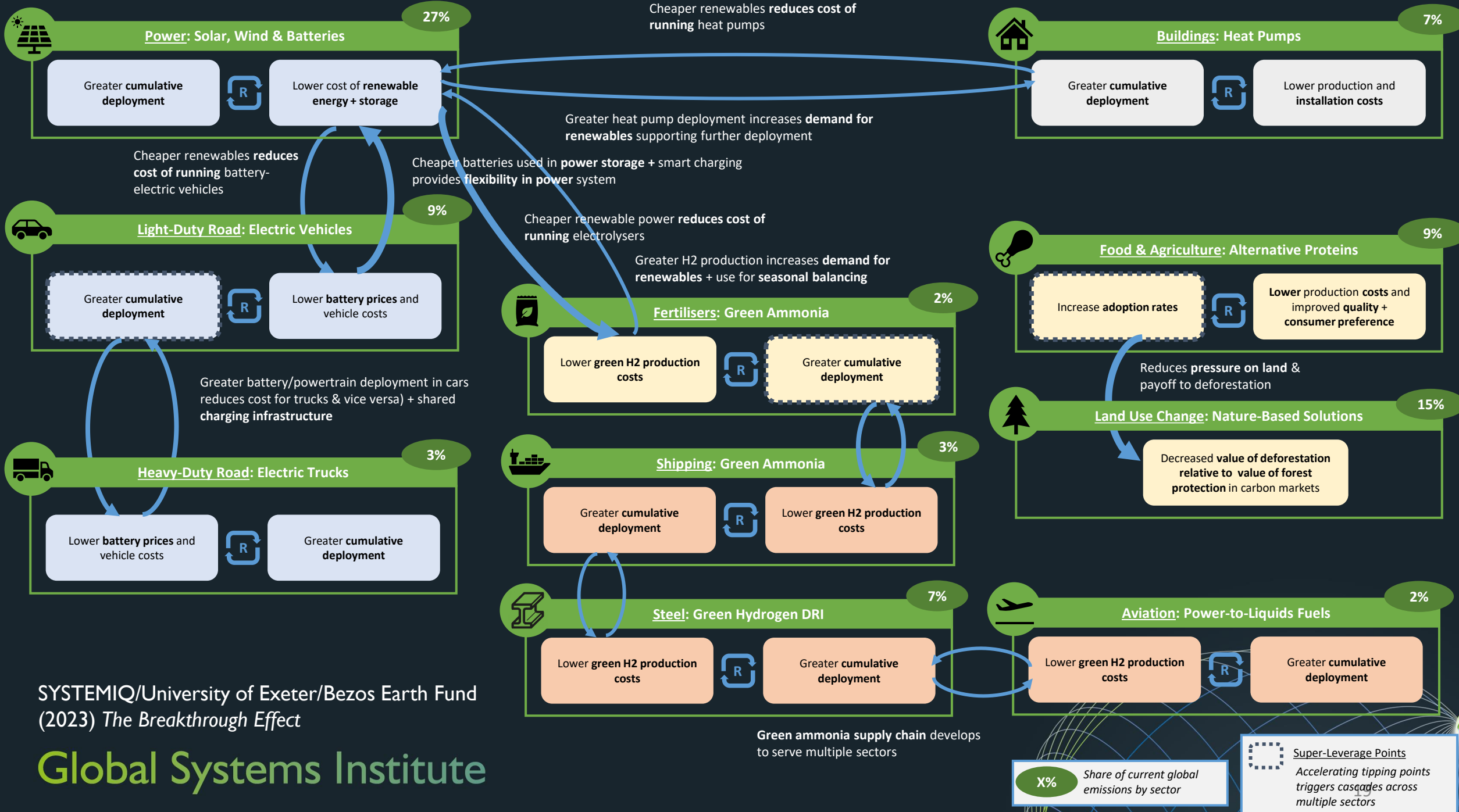


*“The economics of coal have deteriorated dramatically over the last 18 months... the increase in the carbon tax... **flipped the economics over from barely profitable to loss-making.**”* Peter Atherton, utility analyst, April 2016



Solar PV economies of scale





SYSTEMIQ/University of Exeter/Bezos Earth Fund (2023) *The Breakthrough Effect*

Global Systems Institute

Summary

- Exceeding 1.5°C global warming could trigger multiple climate tipping points, and every 0.1°C of warming counts in limiting the risk
- The most studied tipping point (AMOC collapse) would pose existential risks to food production and water supplies
- Limiting global warming to “well below 2°C” now requires positive tipping points to accelerate transformative social-technological change
- Policy interventions at ‘super leverage points’ could trigger positive tipping cascades

