



WORLD MANUFACTURING FORUM

WMF

14 - 15 October 2024

Big Theatre
MIND Milano Innovation District
Milan (Italy)

**NEW PERSPECTIVES
FOR THE FUTURE
OF MANUFACTURING:
Outlook 2030**

Tipping Points for the Manufacturing Sector

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Hoffmann Fellow, World Economic Forum



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NEW PERSPECTIVES
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Outlook 2030

- 1) What are Tipping Points?
- 2) Tipping Point Risks for Manufacturing:
 - a) Earth System Tipping Points
 - b) Human System Tipping Points
- 3) Positive Tipping Point Opportunities for Manufacturing



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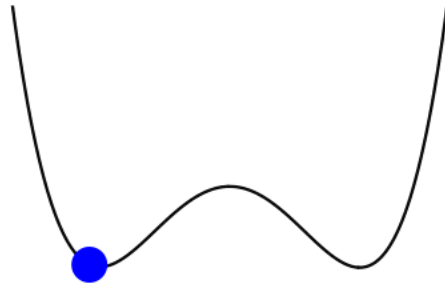
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What are Tipping Points?

Generic example of passing a tipping point





What are Tipping Points?

Definitions

"Change happens slowly, then all at once."

"A small additional change makes a big difference."

Tipping point: the point beyond which self-propelling change occurs in a system, under fixed boundary conditions, giving rise to a qualitative change in state. Self-propelling change is supported by strongly reinforcing (positive) feedback within a system.

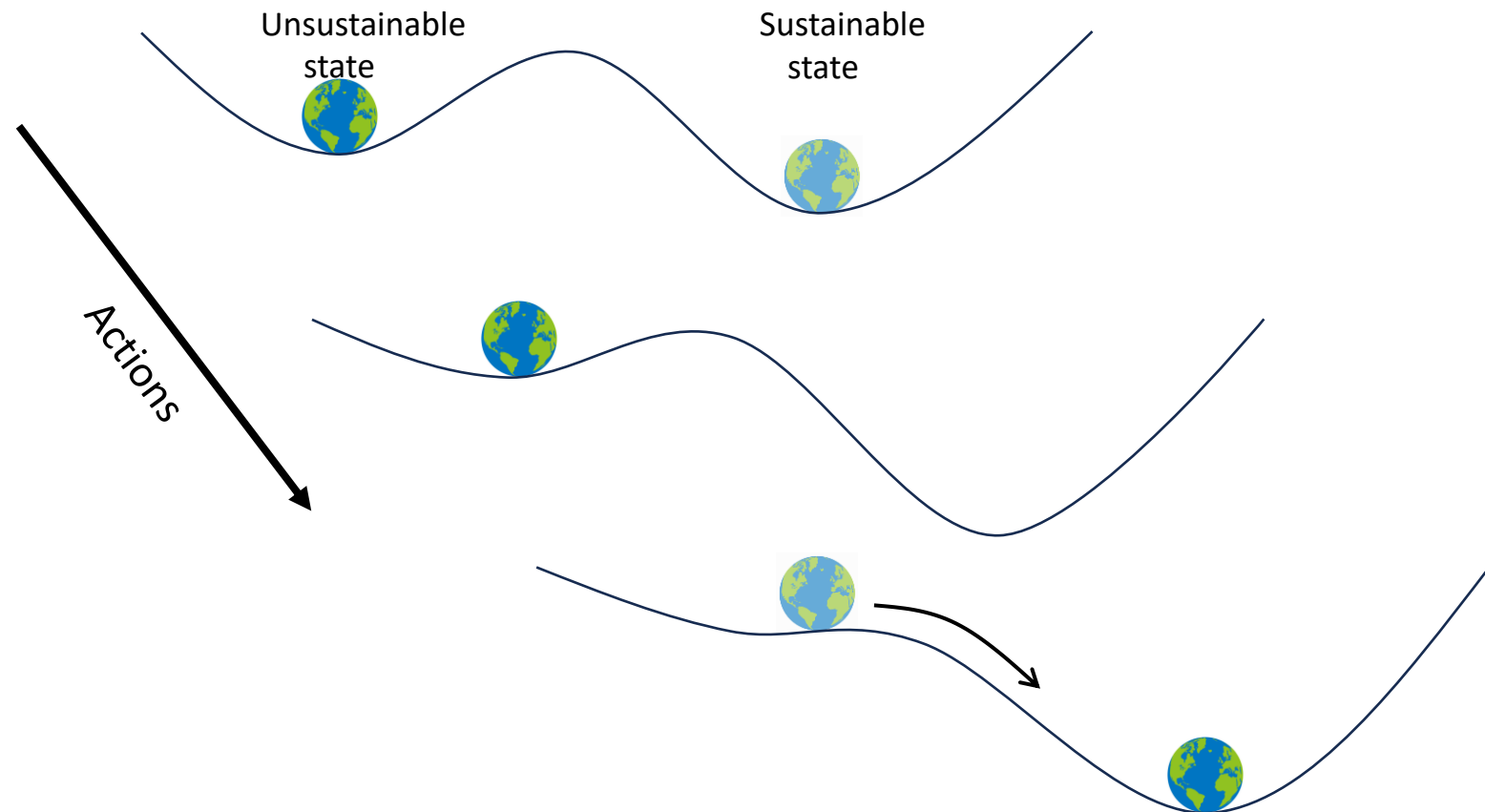
Positive tipping point: the point beyond which there is self-propelling uptake of more sustainable technologies, practices or behaviours.



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What are Positive Tipping Points?





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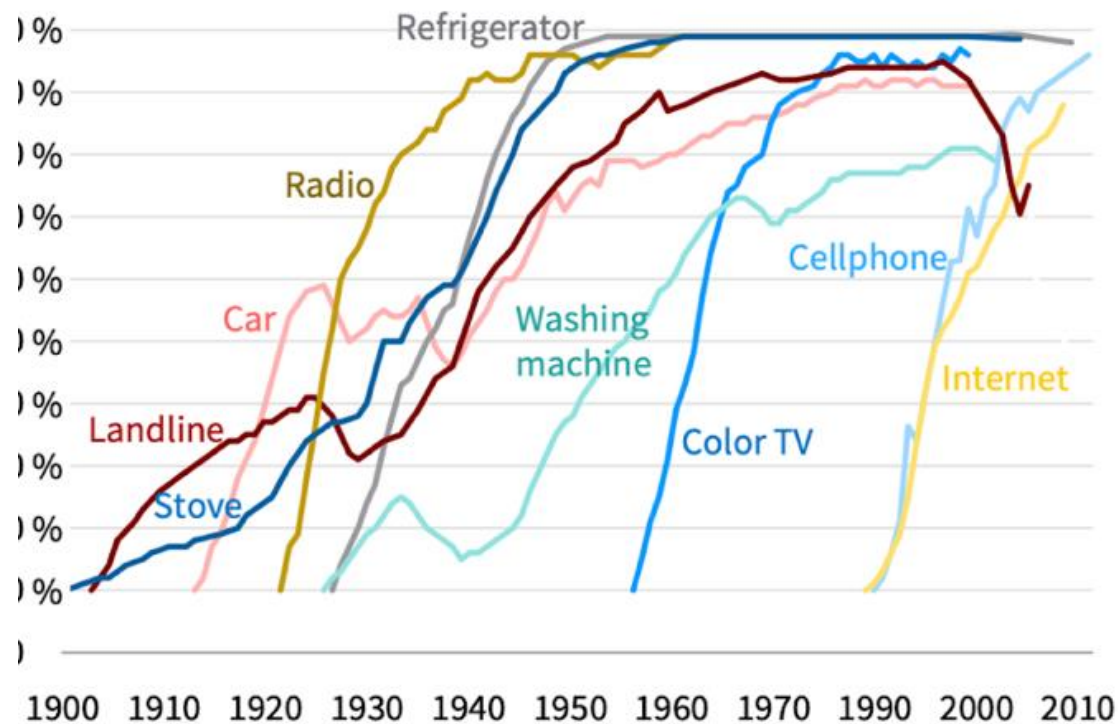
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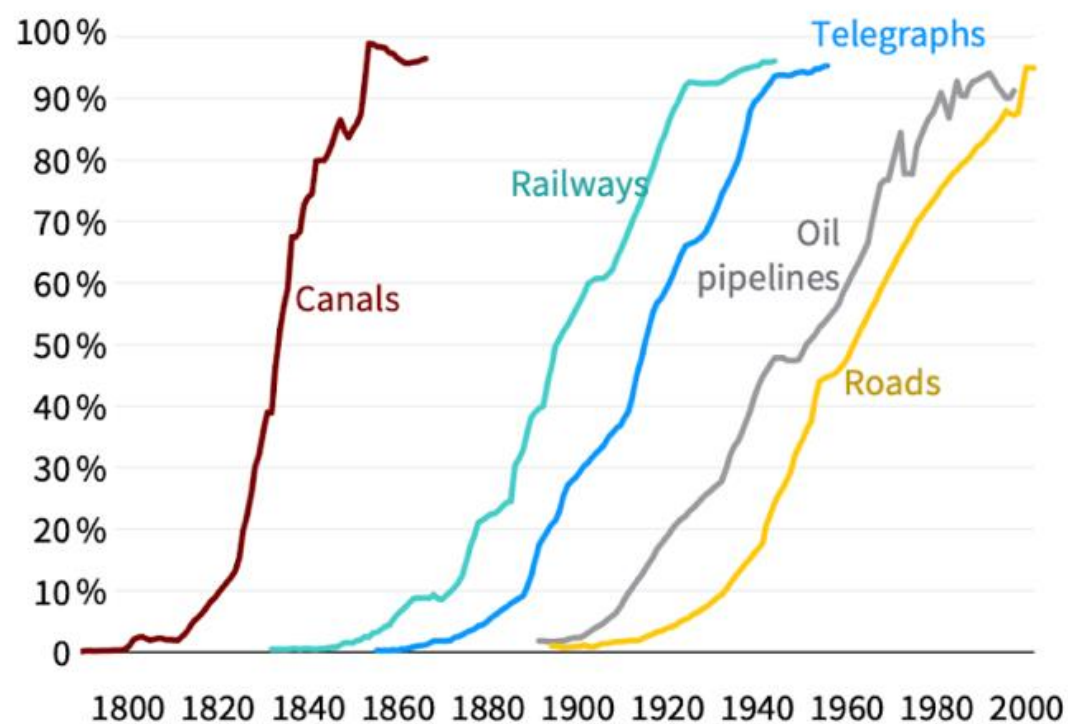


Technological adoption by household in the United States



Rapid exponential growth along S-curves is a standard characteristic of successful new technologies.

Share of maximum size in the United States



S-curve-type growth even applies to infrastructure.



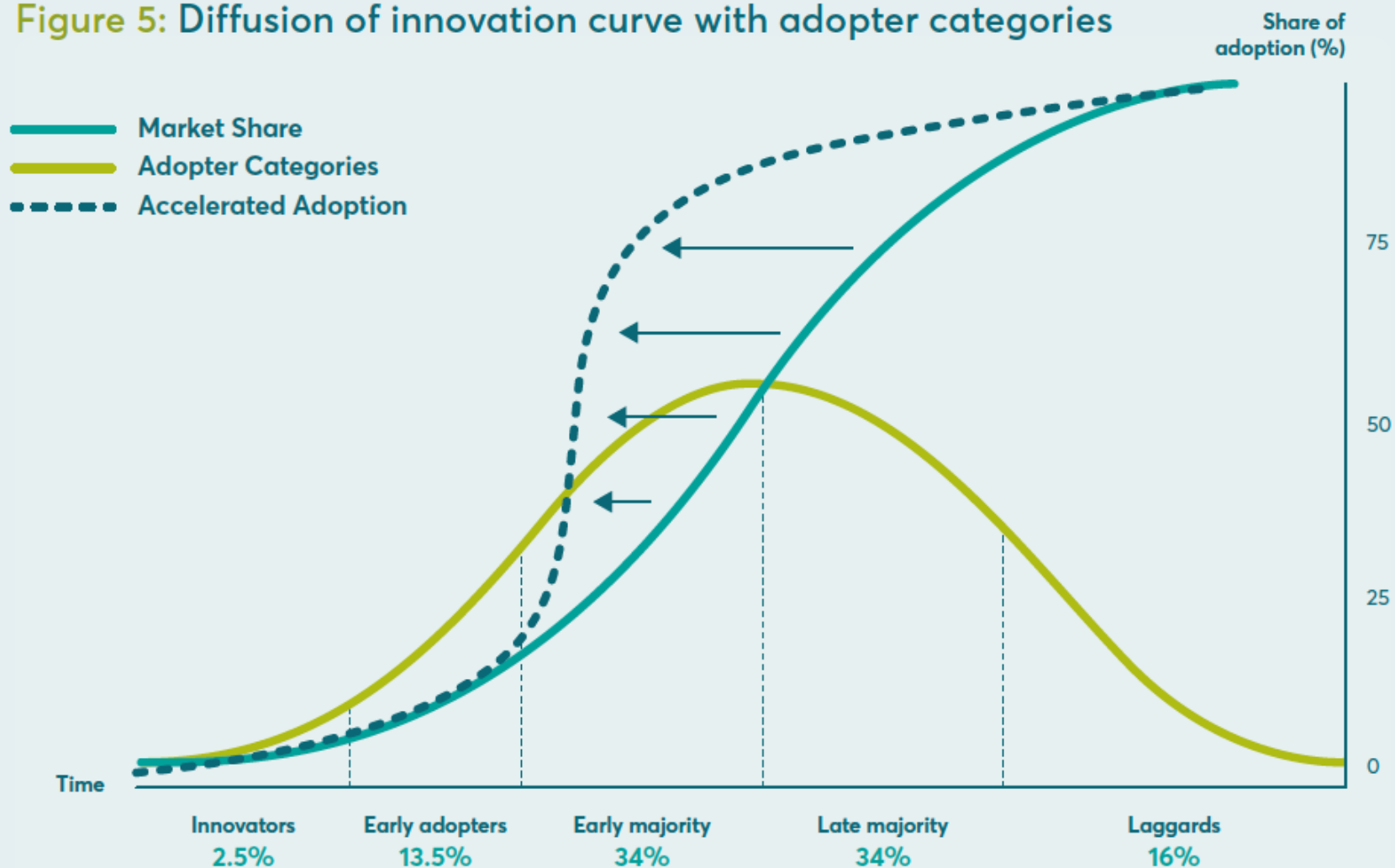
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Figure 5: Diffusion of innovation curve with adopter categories

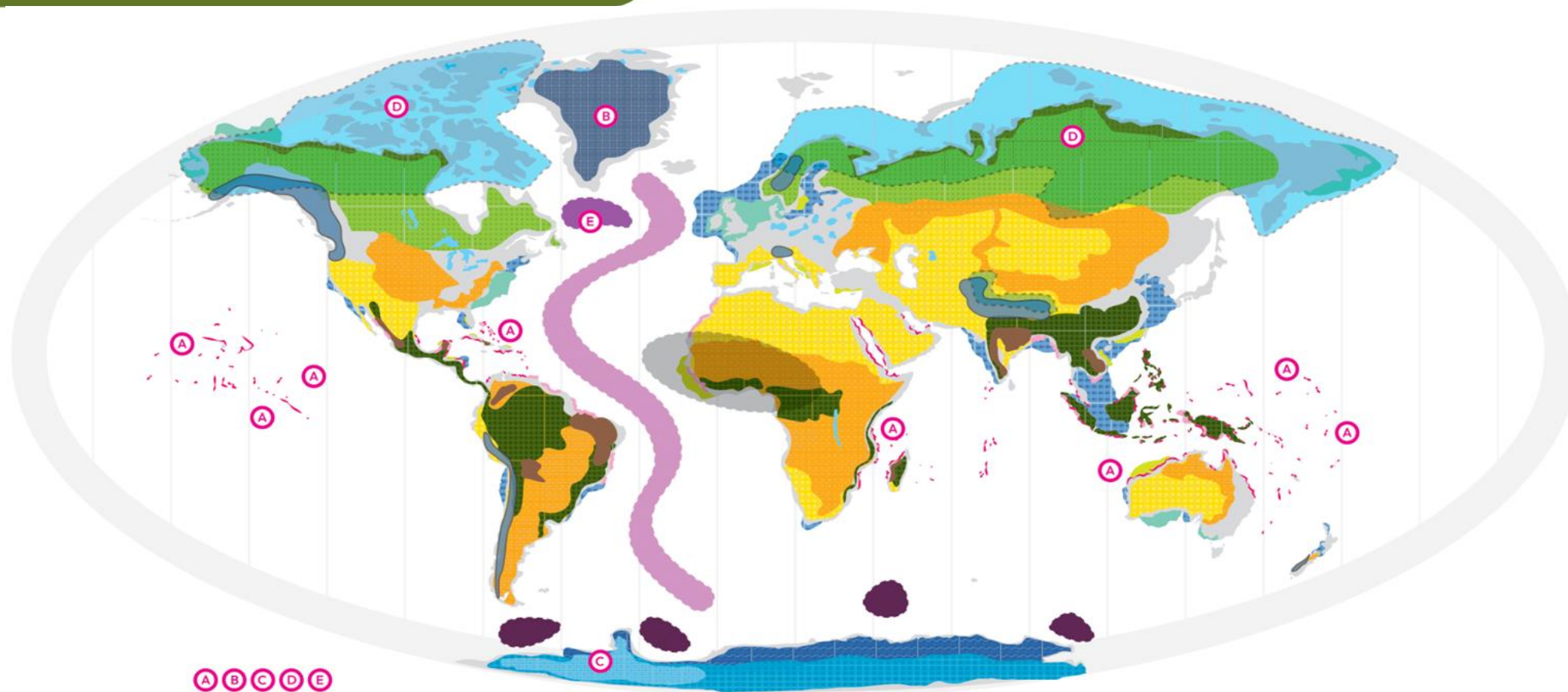




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A B C D E

Closest to tipping - due to global warming

BIOSPHERE

- | | | | |
|---|-----------------------|---|-------------|
|  | Tropical dry forest |  | Lakes |
|  | Tropical rainforest |  | Coral Reefs |
|  | Boreal forest |  | Mangroves |
|  | Tundra |  | Fisheries |
|  | Savannas & Grasslands |  | Seagrass |
|  | Drylands |  | Kelp forest |

CRYOSPHERE

-  Greenland Ice Sheet **(B)**
-  West Antarctic Ice Sheet **(C)**
-  Non-marine East Antarctica
-  Marine basins East Antarctica
-  Permafrost **(D)**
-  Mountain Glaciers

OCEAN & ATMOSPHERE CIRCULATIONS

-  Atlantic Meridional Overturning Circulation (AMOC)
-  Subpolar Gyre (SPG) **E**
-  Southern Ocean Overturning
-  West African monsoon



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Harmful tipping points in the natural world pose some of the gravest threats faced by humanity.

Their triggering will severely damage our planet's life-support systems and threaten the stability of our societies

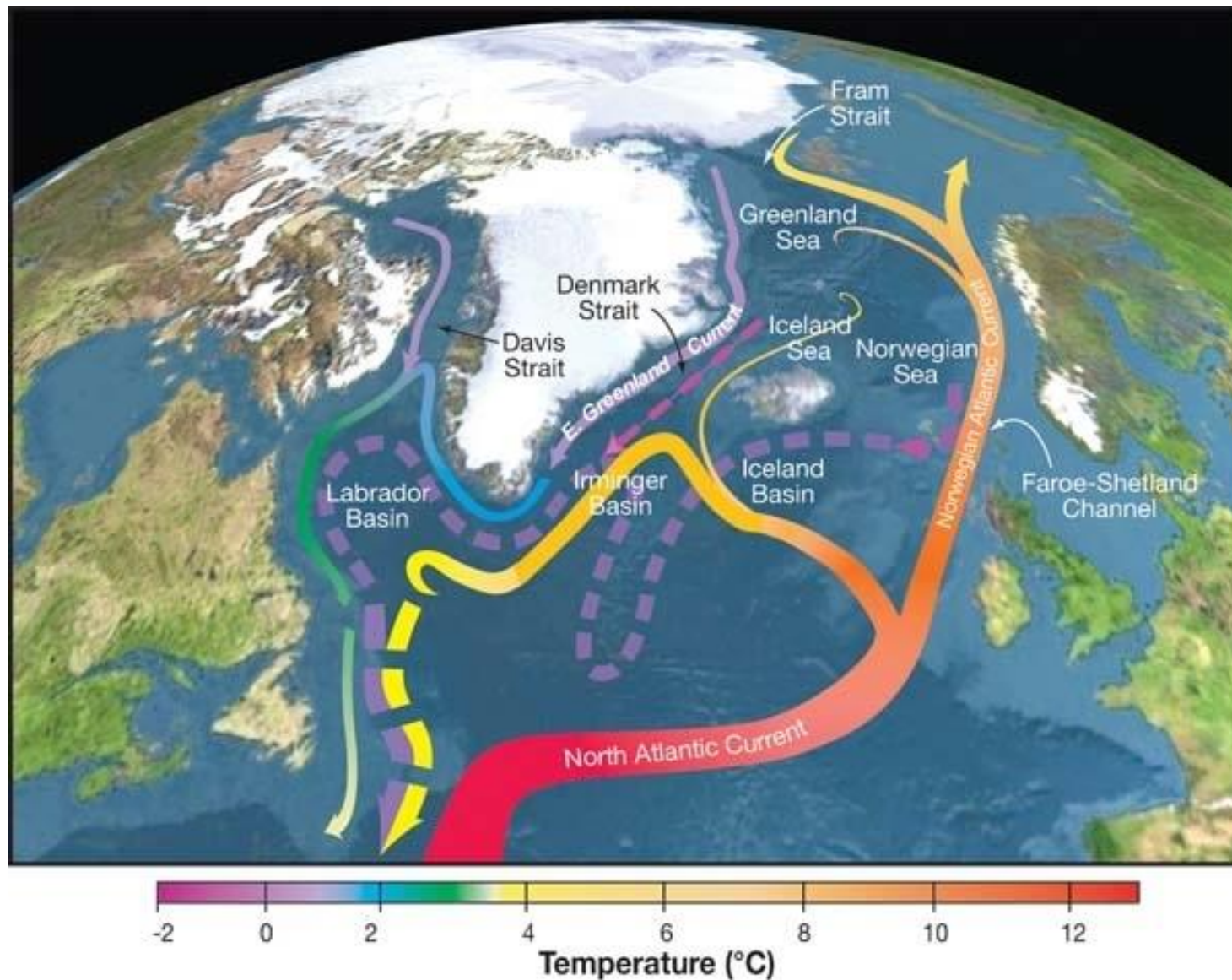


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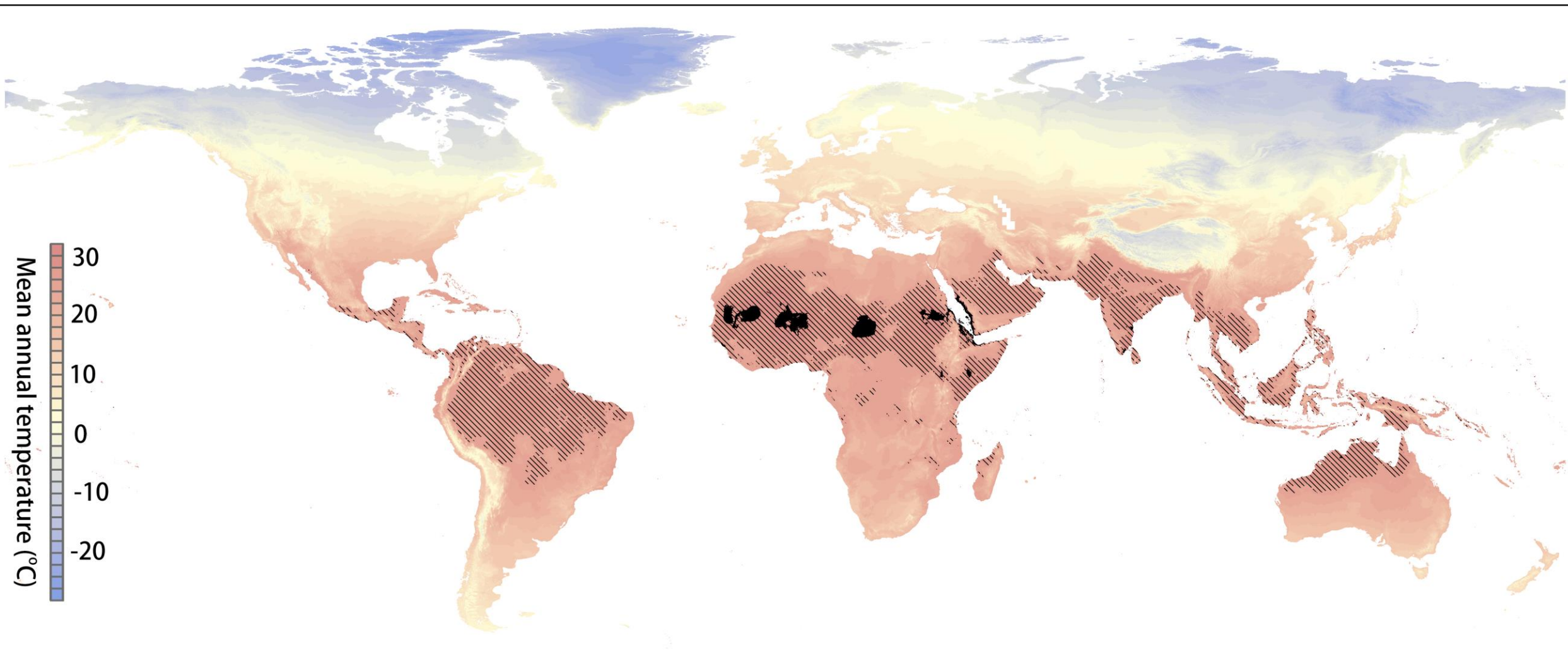


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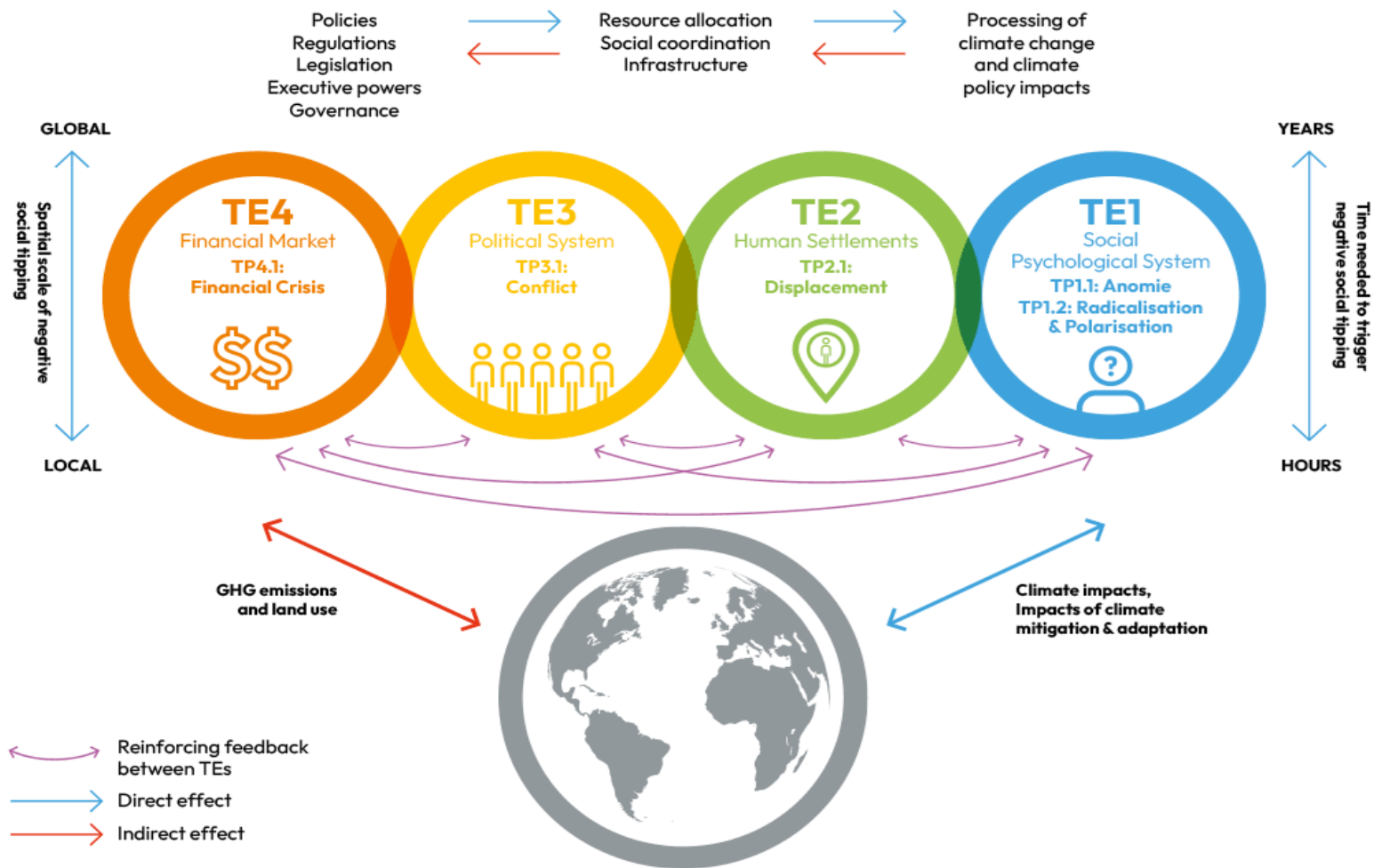
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SOCIAL SYSTEMS NEGATIVE TIPPING ELEMENTS



not an exclusive list!



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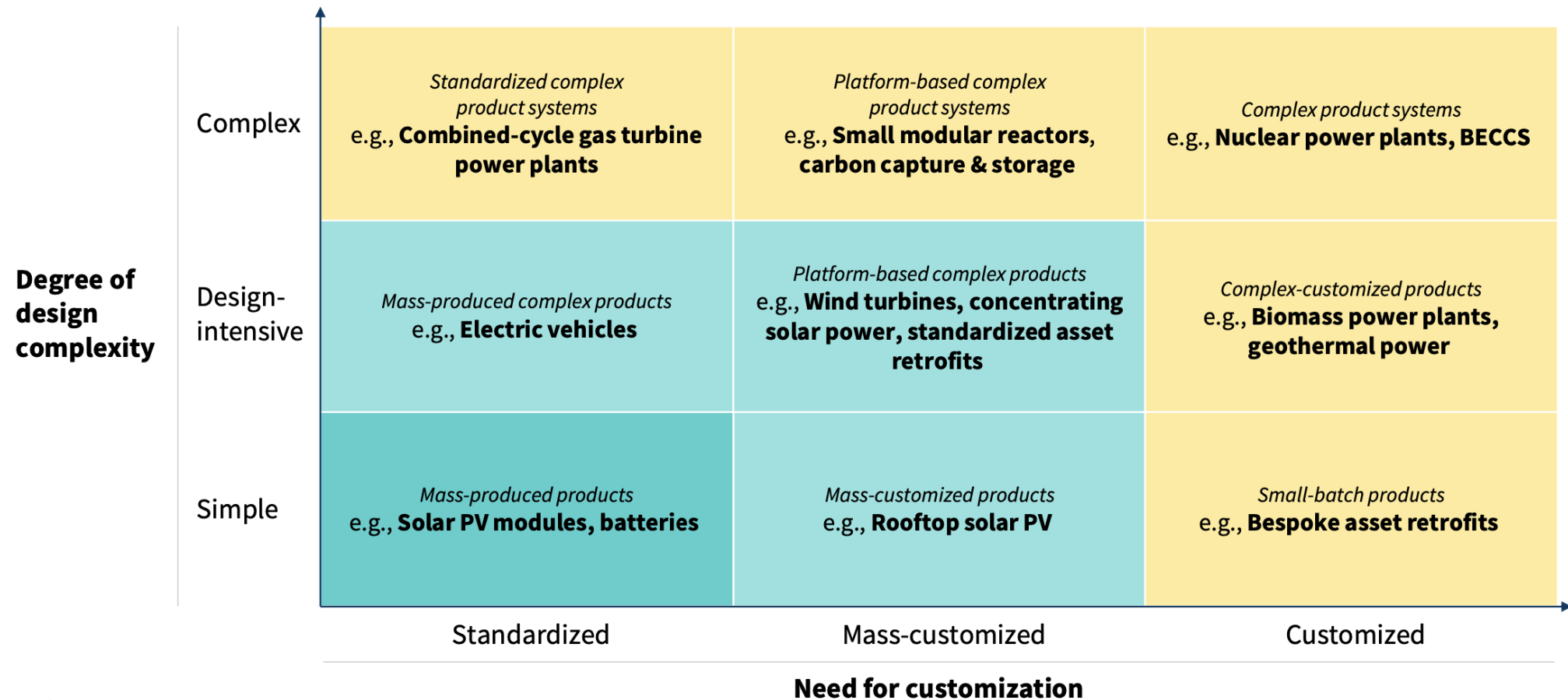
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Make good bets on the technologies of the future

Focus on modular technologies with steep learning curves; avoid expensive and hard-to-deploy technologies





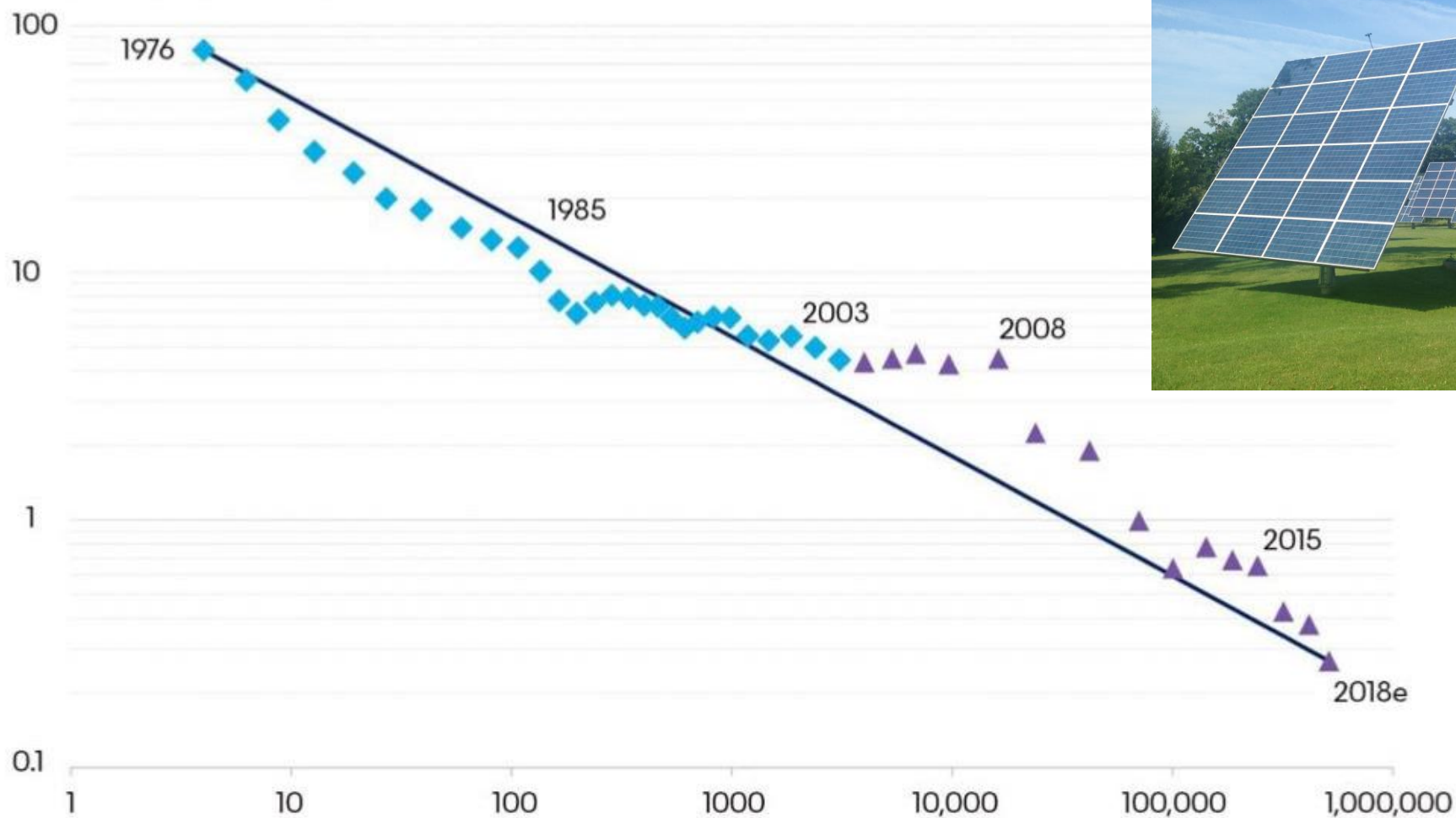
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Module price (\$/W, 2018 real)



◆ Historic prices (Maycock)

▲ Chinese c-Si module prices (BNEF)

— Experience curve at 28.5%



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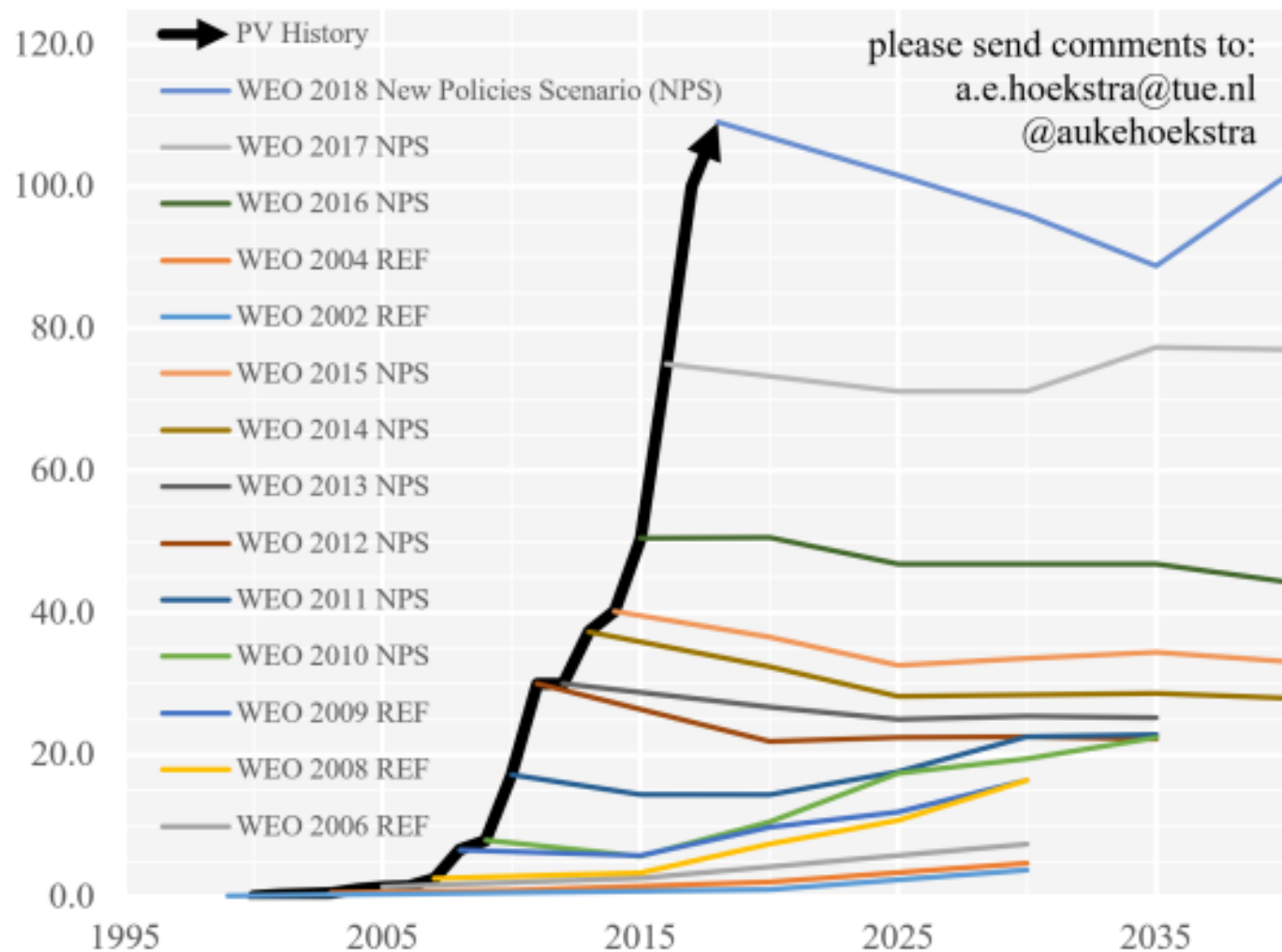
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Annual PV additions: historic data vs IEA WEO predictions

In GW of added capacity per year - source International Energy Agency - World Energy Outlook





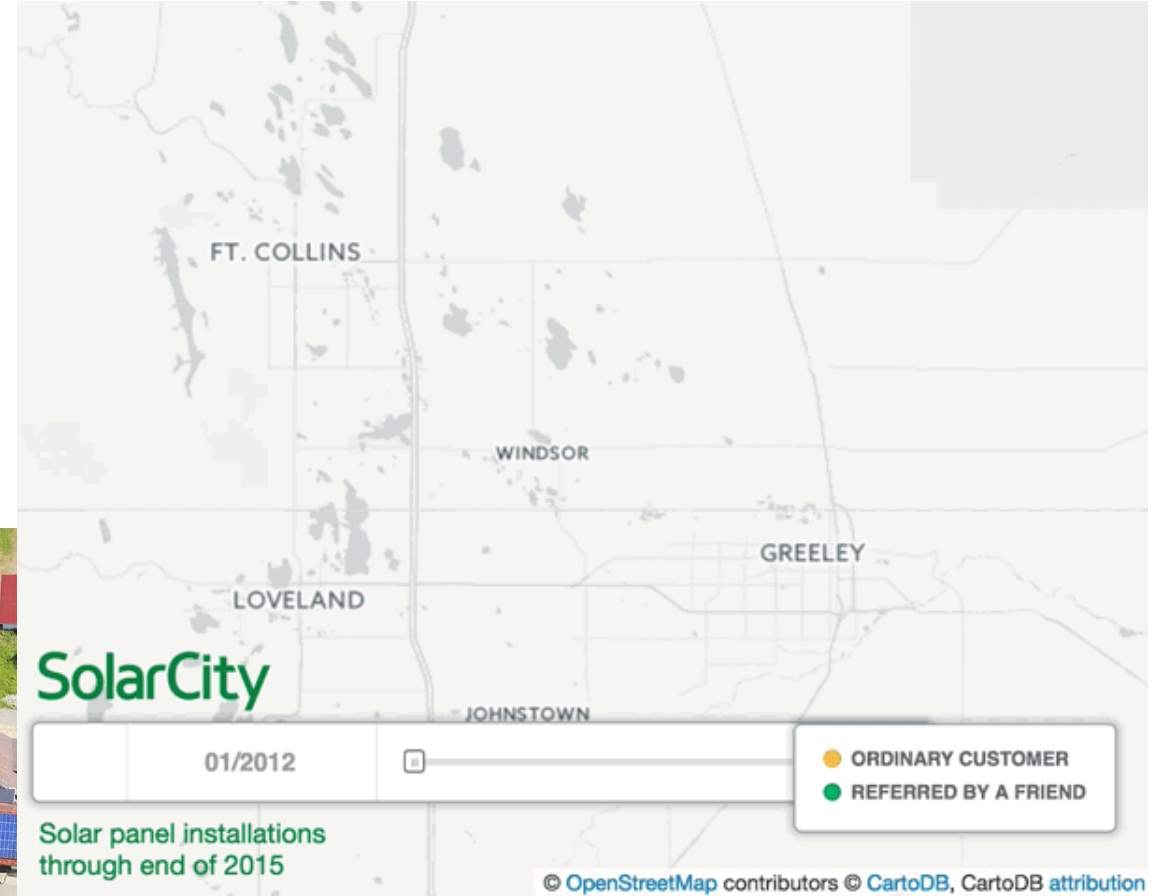
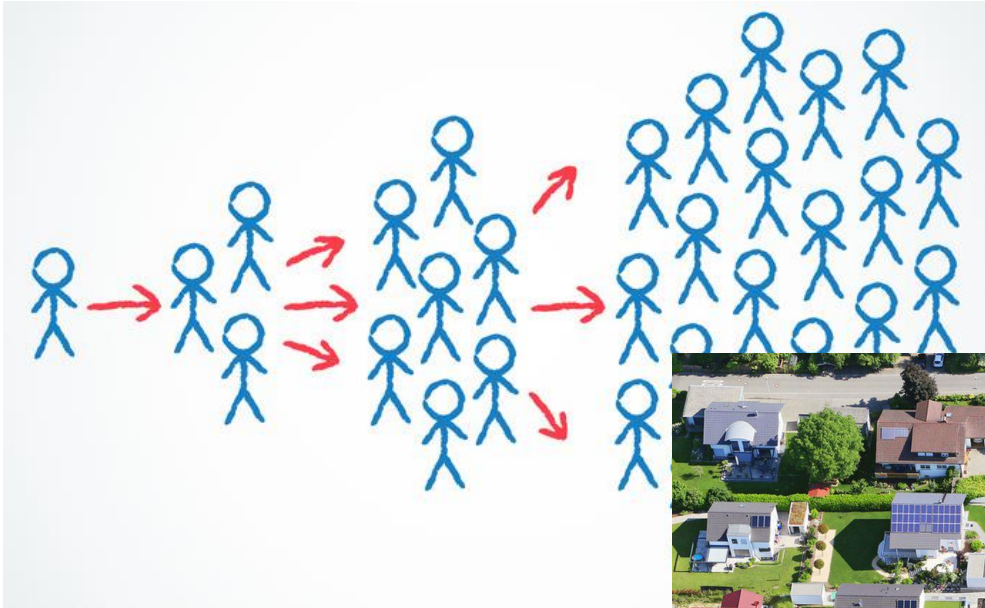
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Social Contagion





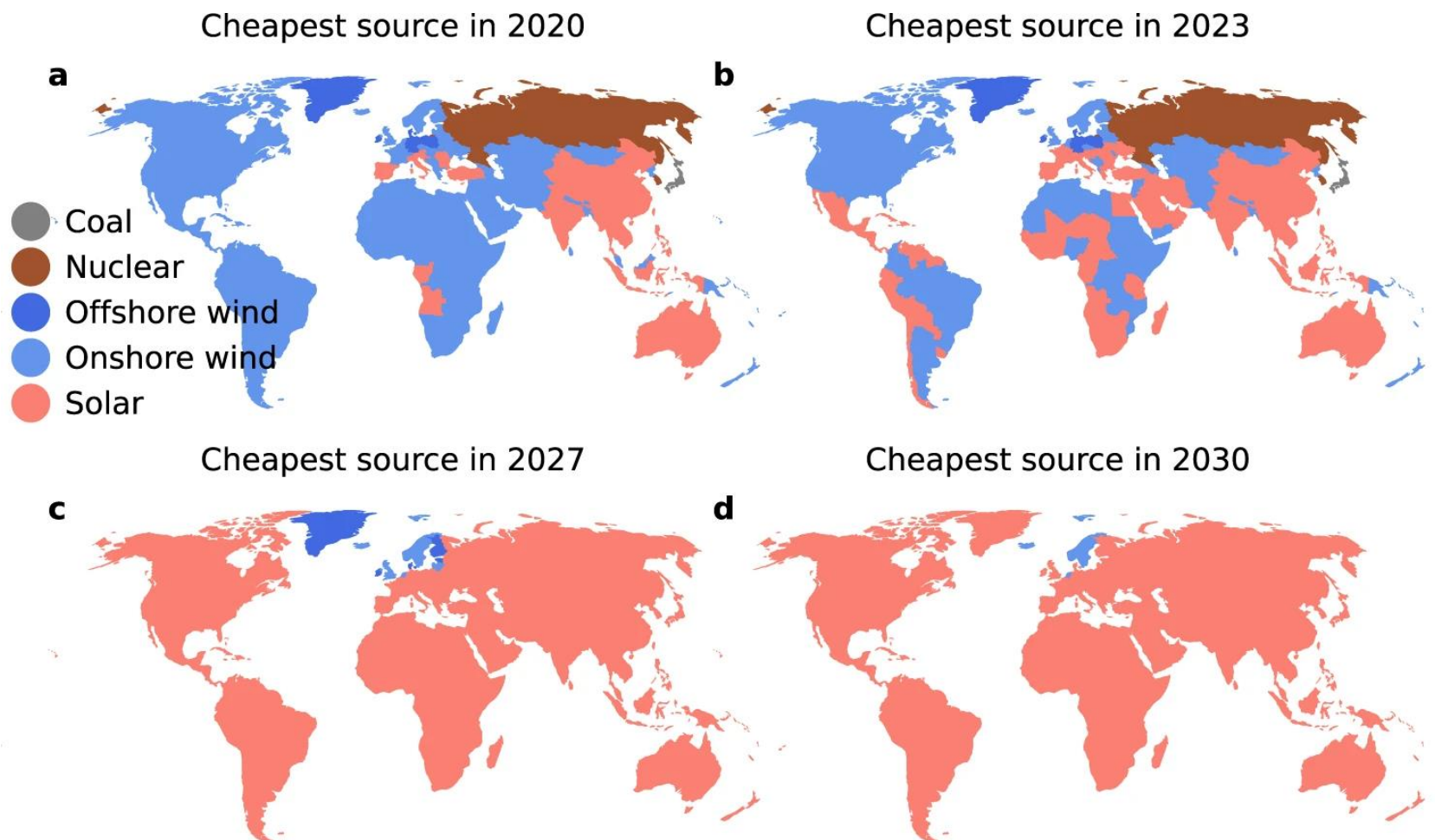
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Levelized Cost of electricity including storage

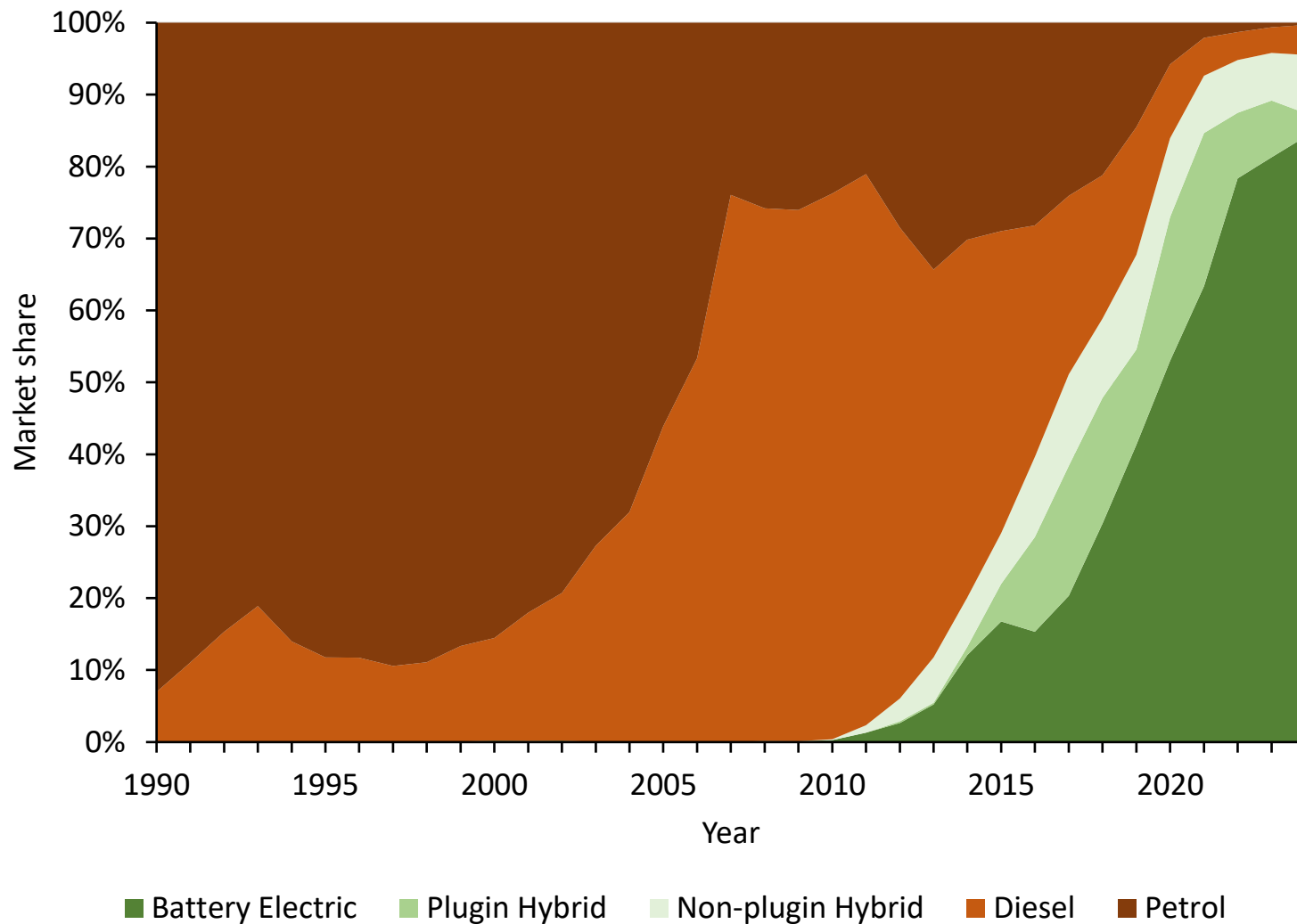




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Norwegian Car Sales



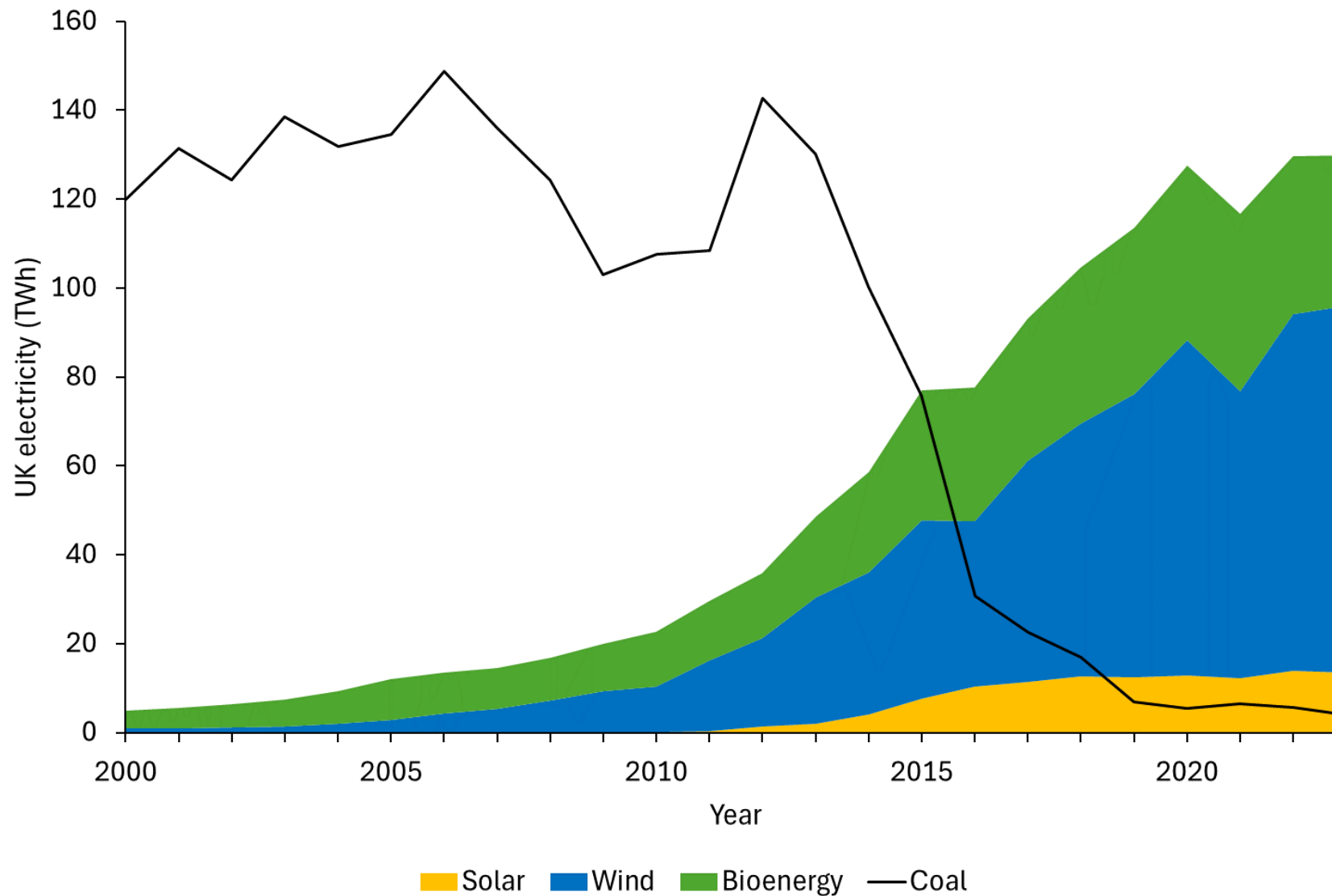


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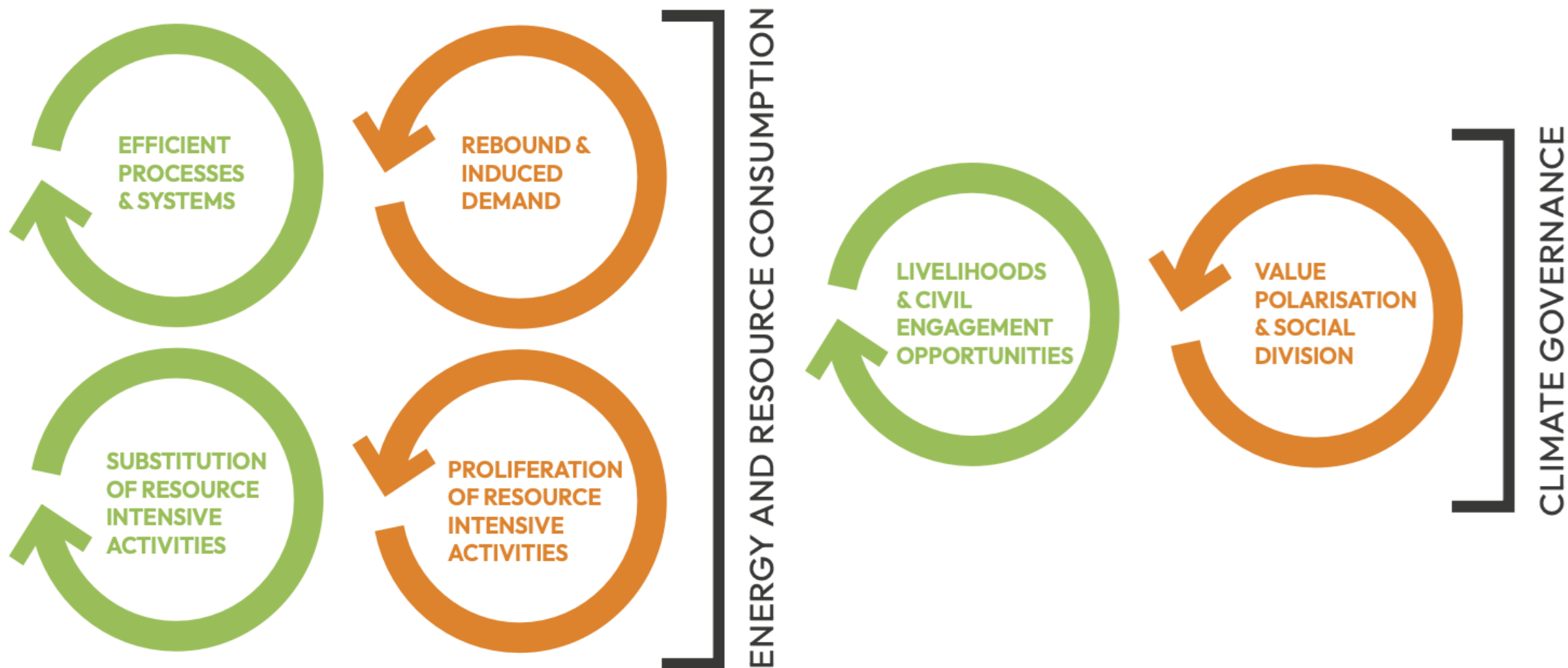
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DIGITALISATION DYNAMICS BOTH **HELP** AND **HINDER**





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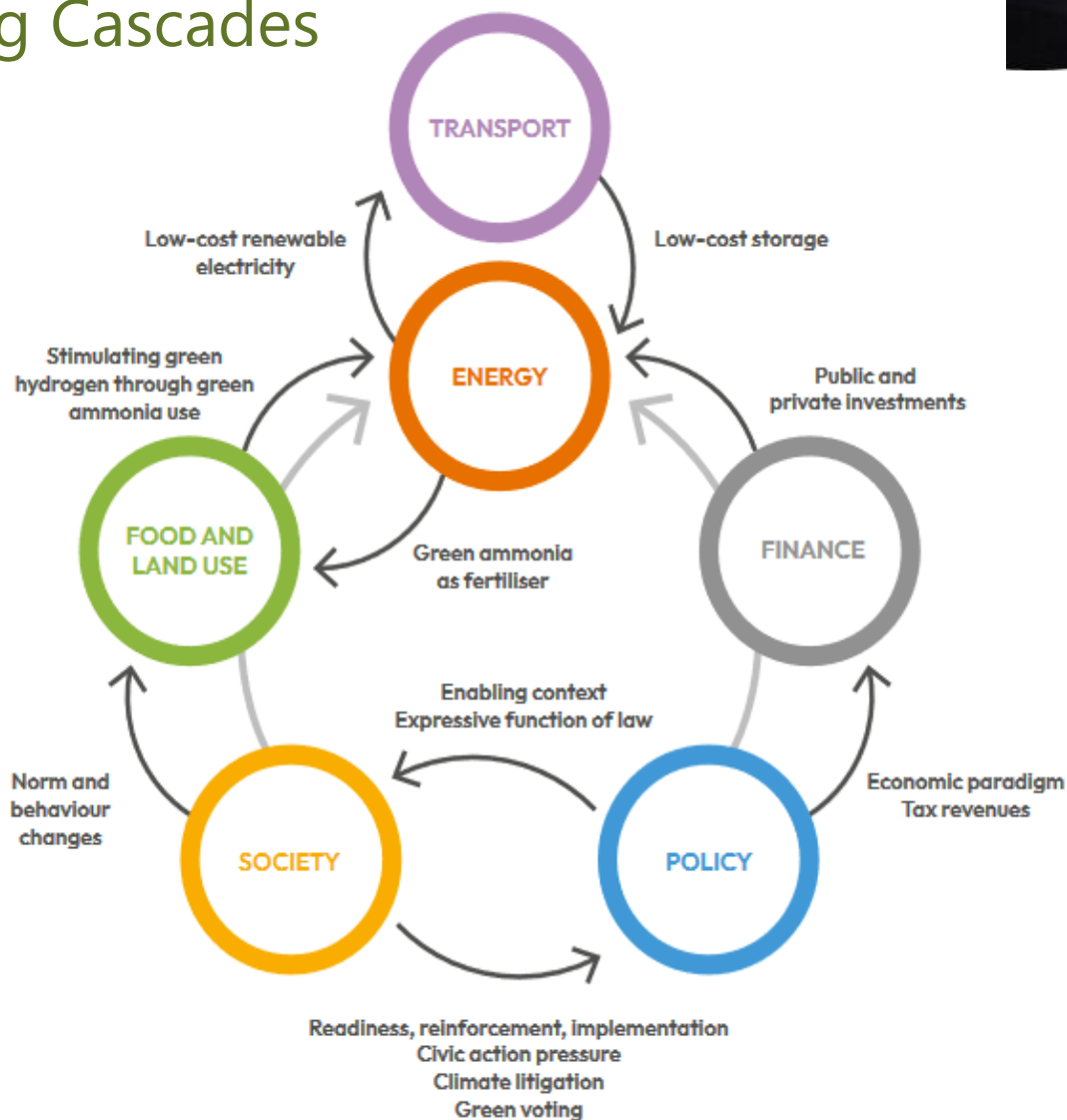
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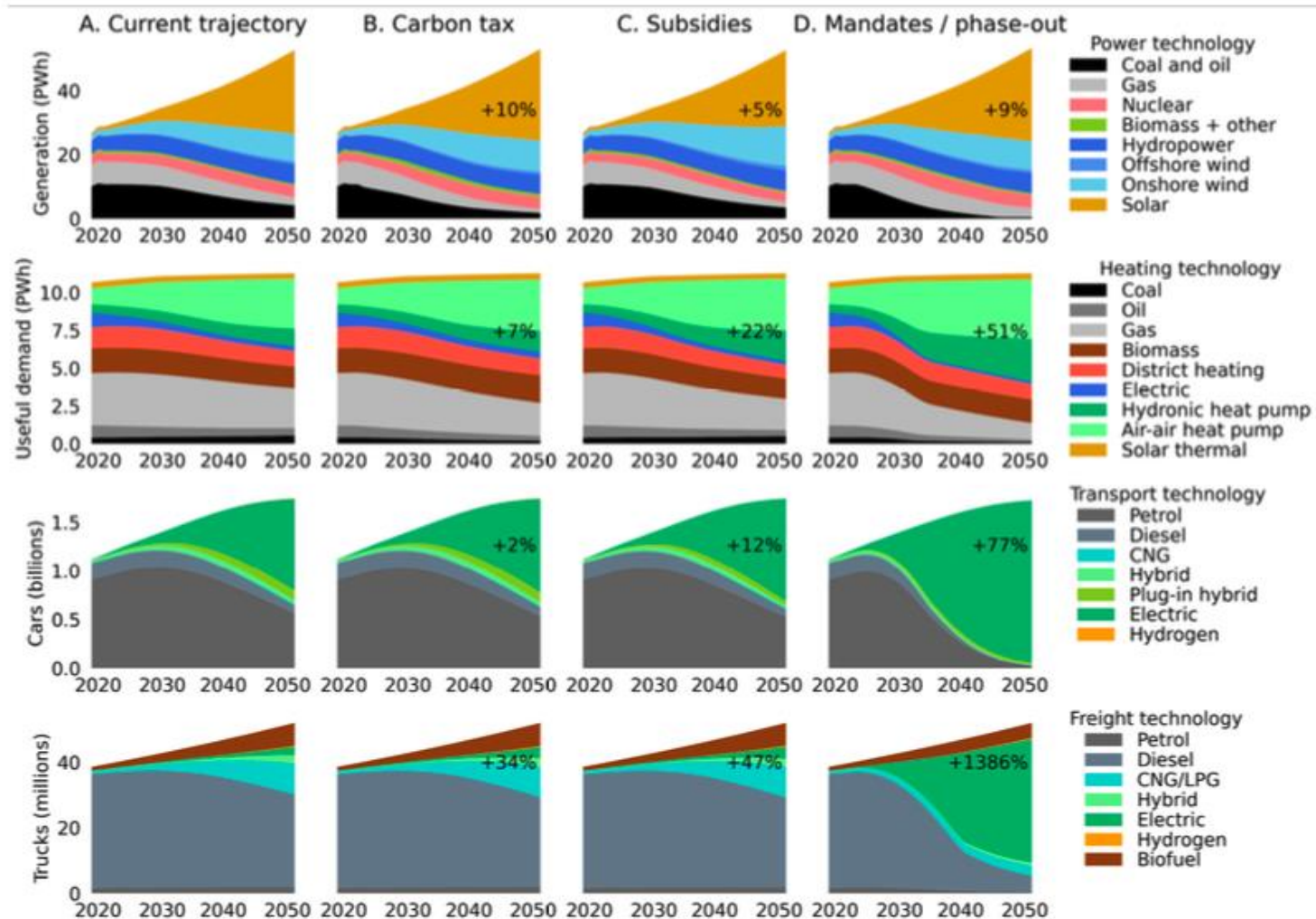
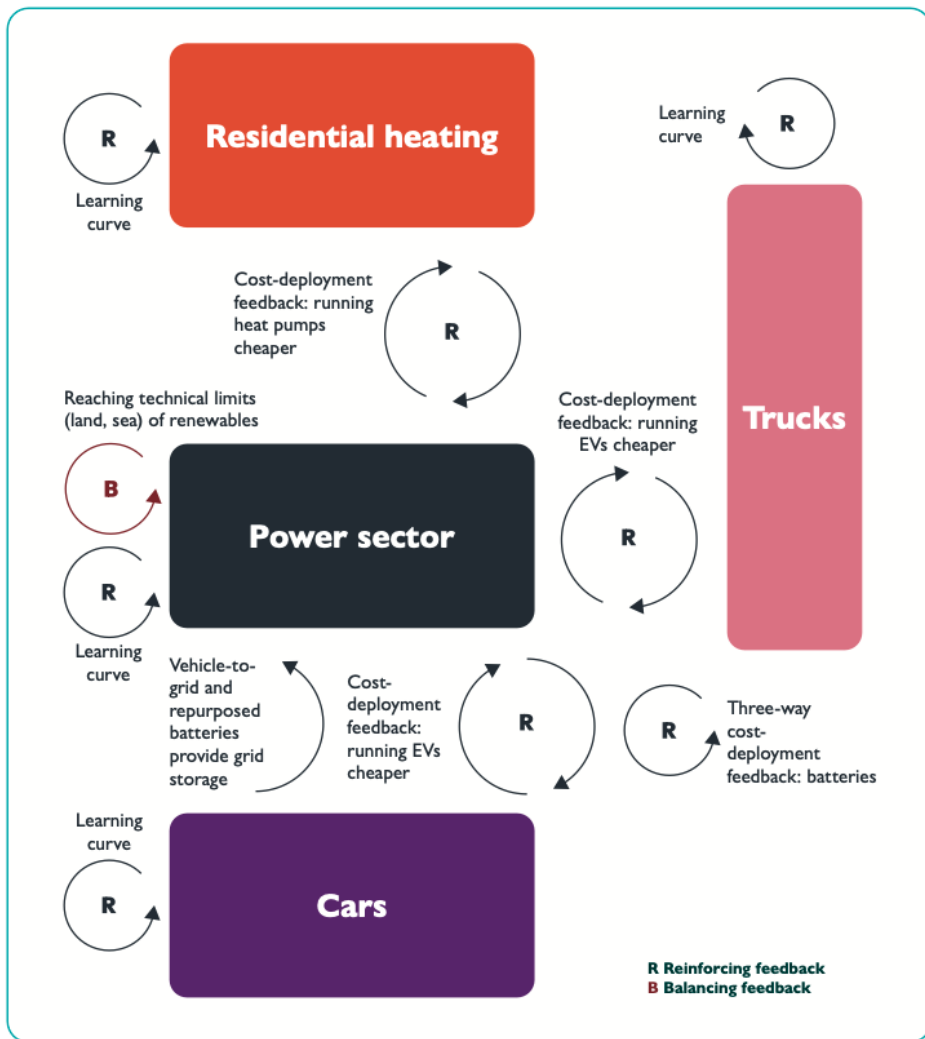


Positive Tipping Cascades





Interactions and cascades in power, cars, trucks and heating



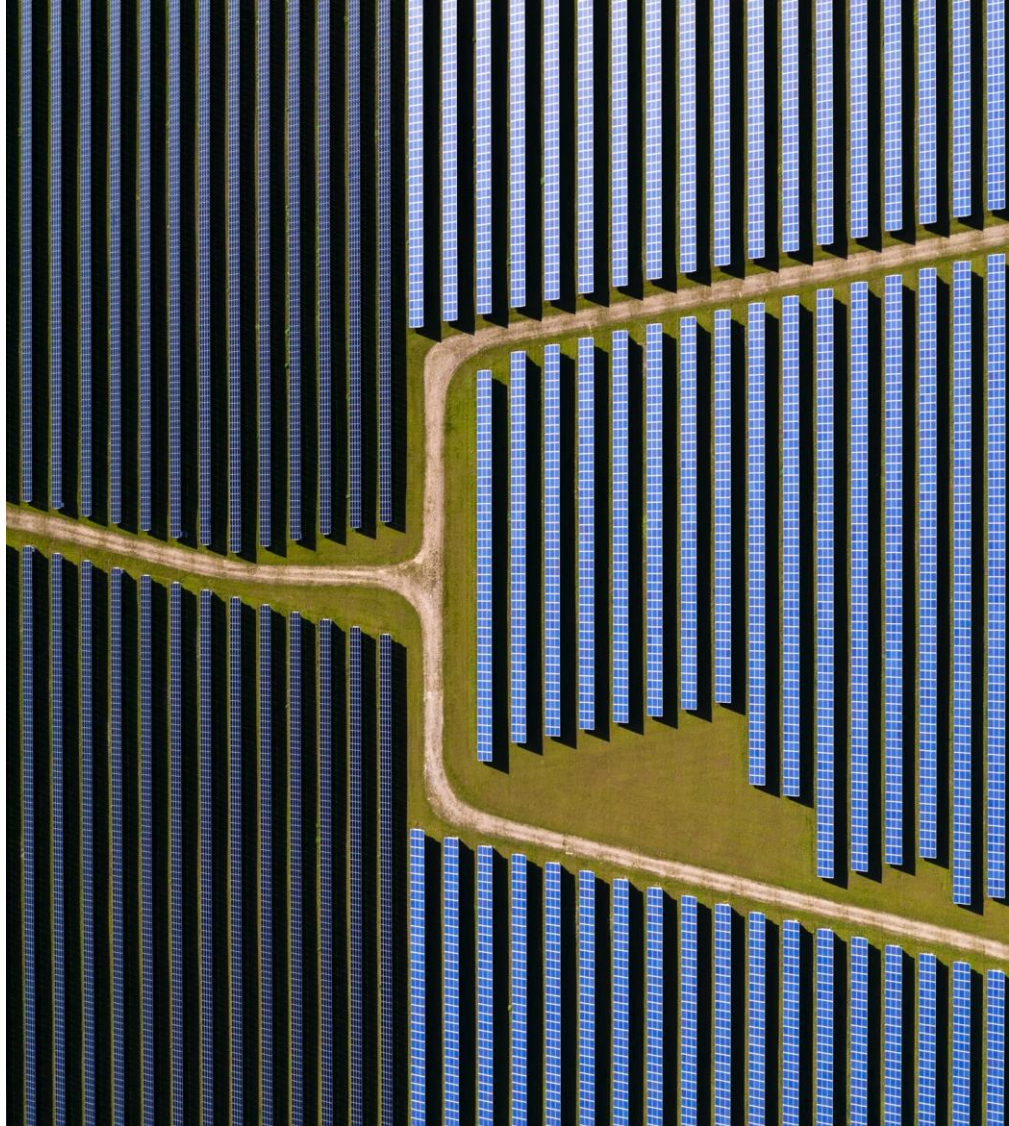


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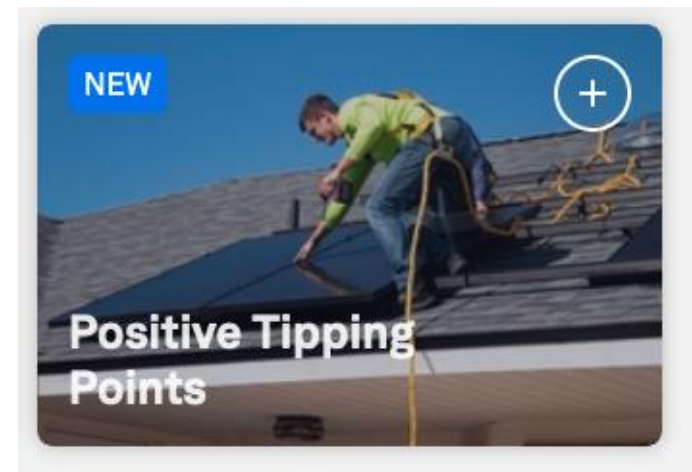
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Sneak Peek

- Positive Tipping Points Collection of Transformation Maps

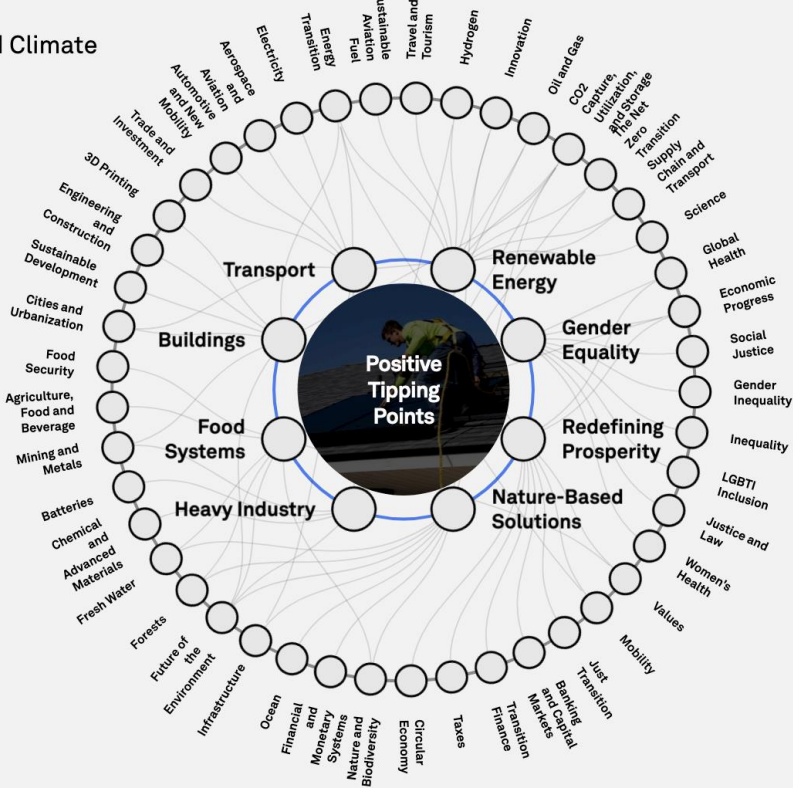


Positive Tipping Points



Home Discover ▼ Monitor Create More ▼

← Nature and Climate



PRO +



Positive Tipping Points

Curation: University of Exeter

The risks posed by negative tipping points in Earth systems are now so severe, and the collective action needed to stop short of these thresholds in the melting of ice sheets, the disappearance of forests, and the dying of coral reefs is so overdue, that we urgently need “positive”

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Summary

The exponential growth of renewable solar and wind power, electrification, and efficiency is unstoppable.

It's happening faster than you think.

We must ensure that developing nations leapfrog into a post-carbon economy.

Rethink risk: the fossil fuel economy is still betting on business-as-usual. We are heading towards a stranded capital tipping point – especially of human capital.

We have agency. Help trigger positive tipping points. Mandate for 100% renewable power, transport, heating and cooling, and sustainable food procurement in your business.



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