ETH zürich

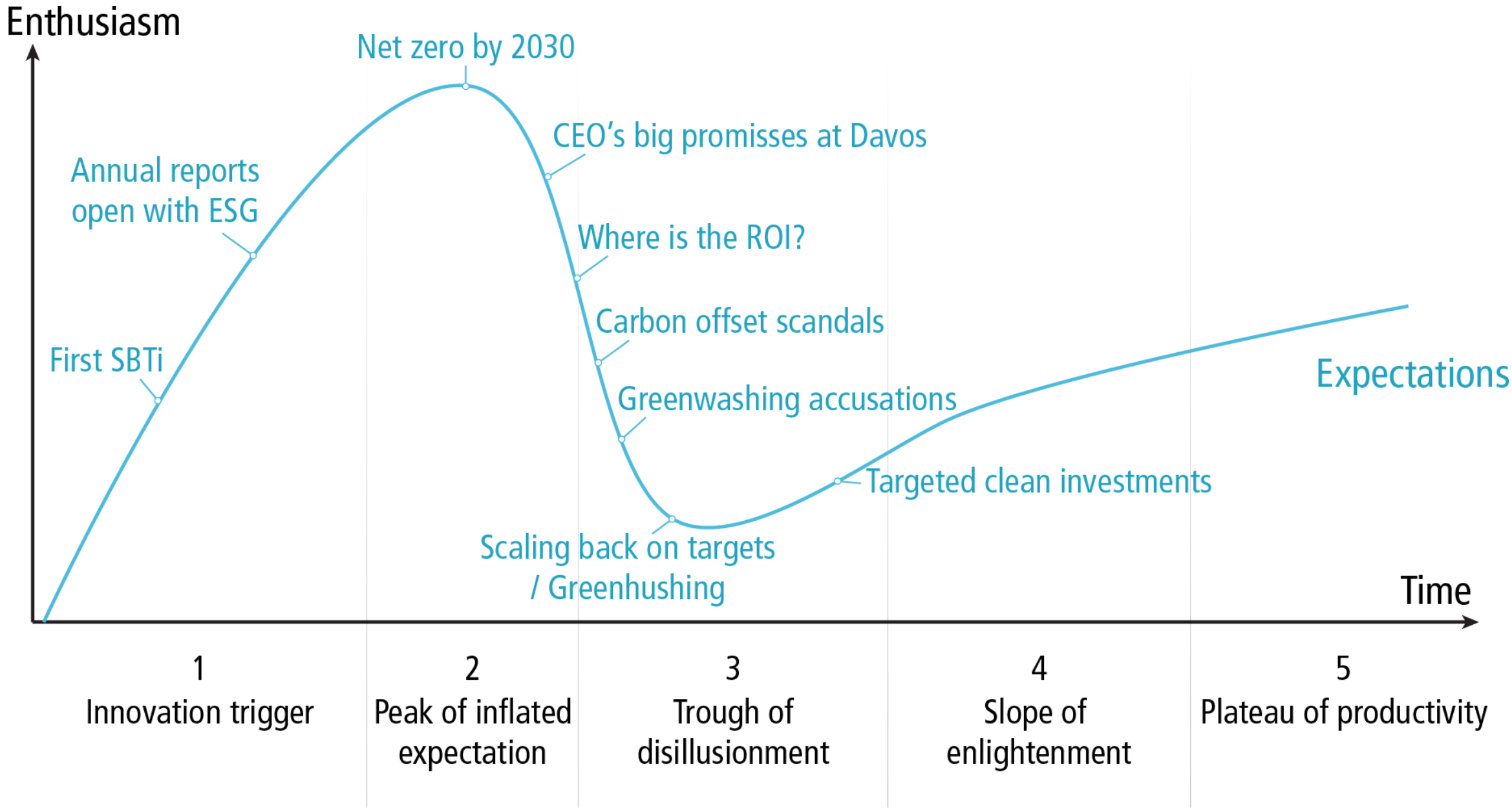
KLIMA HUB



Food for Thought from (Climate) Research

Cyril Brunner

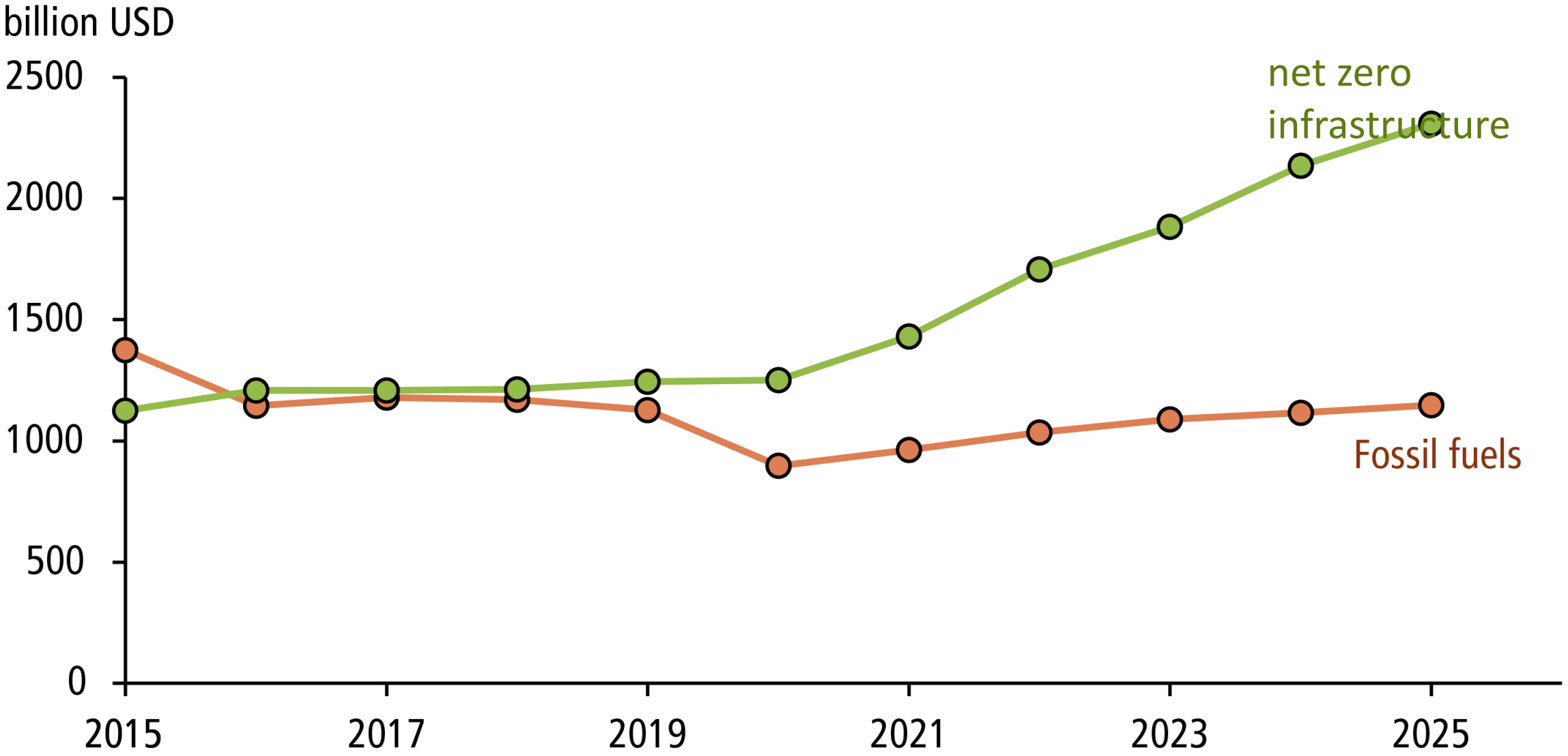
D USYS



Sources: Gartner; Bain analysis; sirius



Global investment and spending on net zero and fossil fuel infrastructure



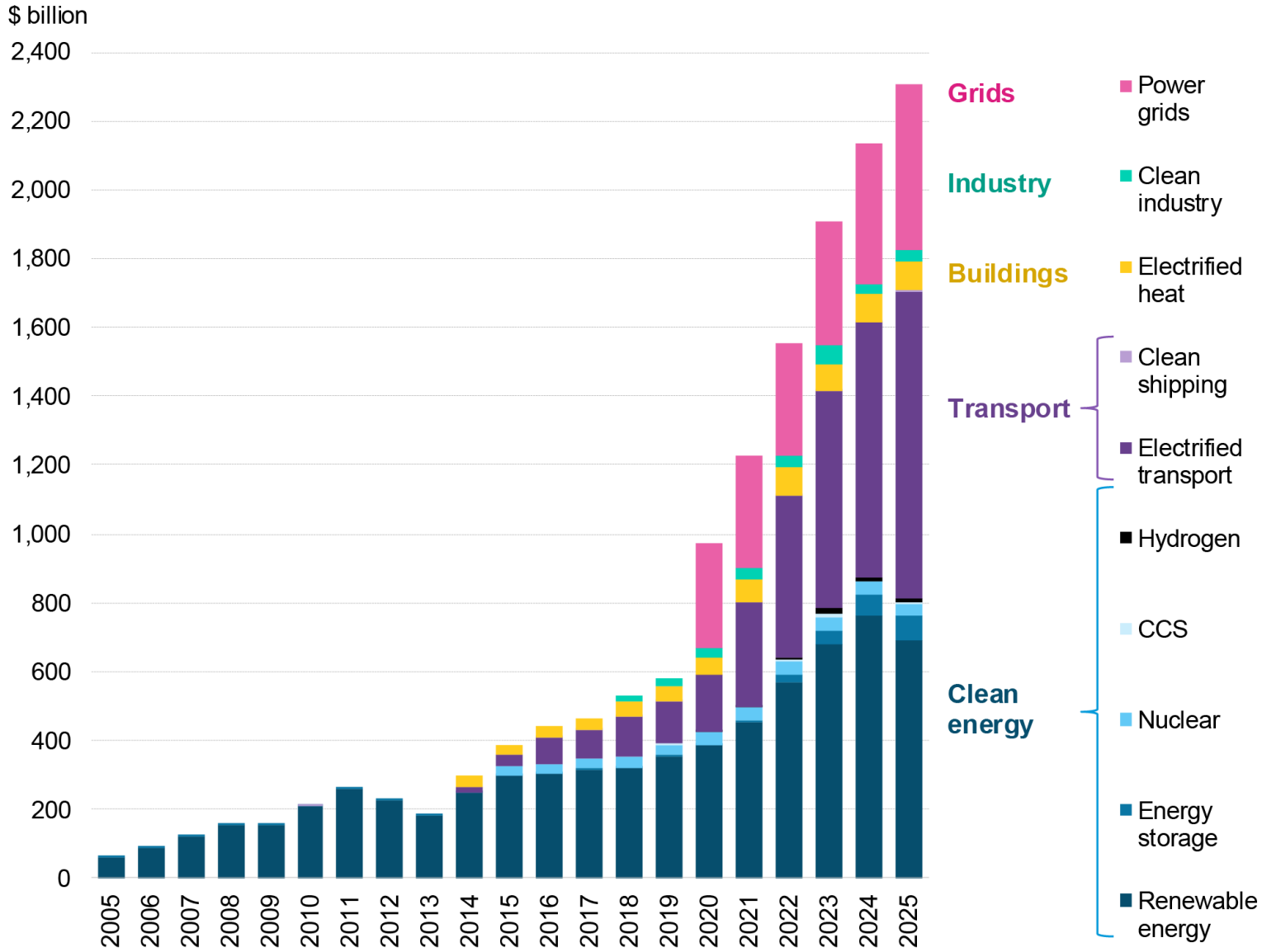
Source: BloombergNEF (2026); IEA (2025): World Energy Investment 2025 (2026)



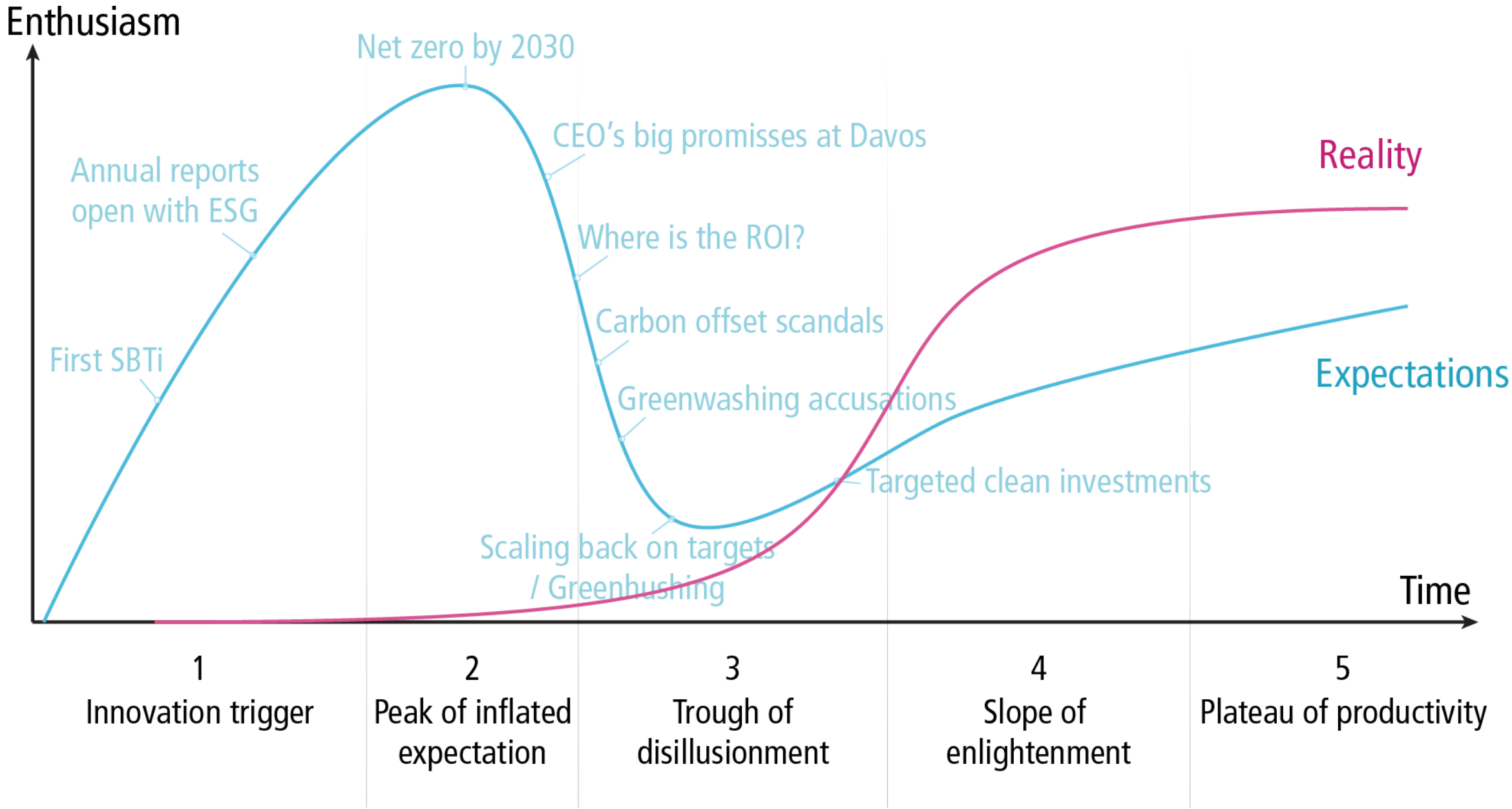

Turning
sunlight
into fuel.
Synhelion
solar fuels
solar fuel
solar fuel
solar fuel
solar fuel

Investments for the net zero transition rarely go toward cutting-edge technologies

Global investment in energy transition, by sector



Source: BloombergNEF, Energy Transition Investment Trends 2026



Sources: Gartner; Bain analysis; sirius

Wir haben alle Mittel, alles Wissen, alle Technologien, um klimaneutral zu werden



Elektrifizierung der Mobilität





Weniger Nahrungsmittel von Wiederkäuern

Kreislaufwirtschaft

Erneuerbare Kraftstoffe





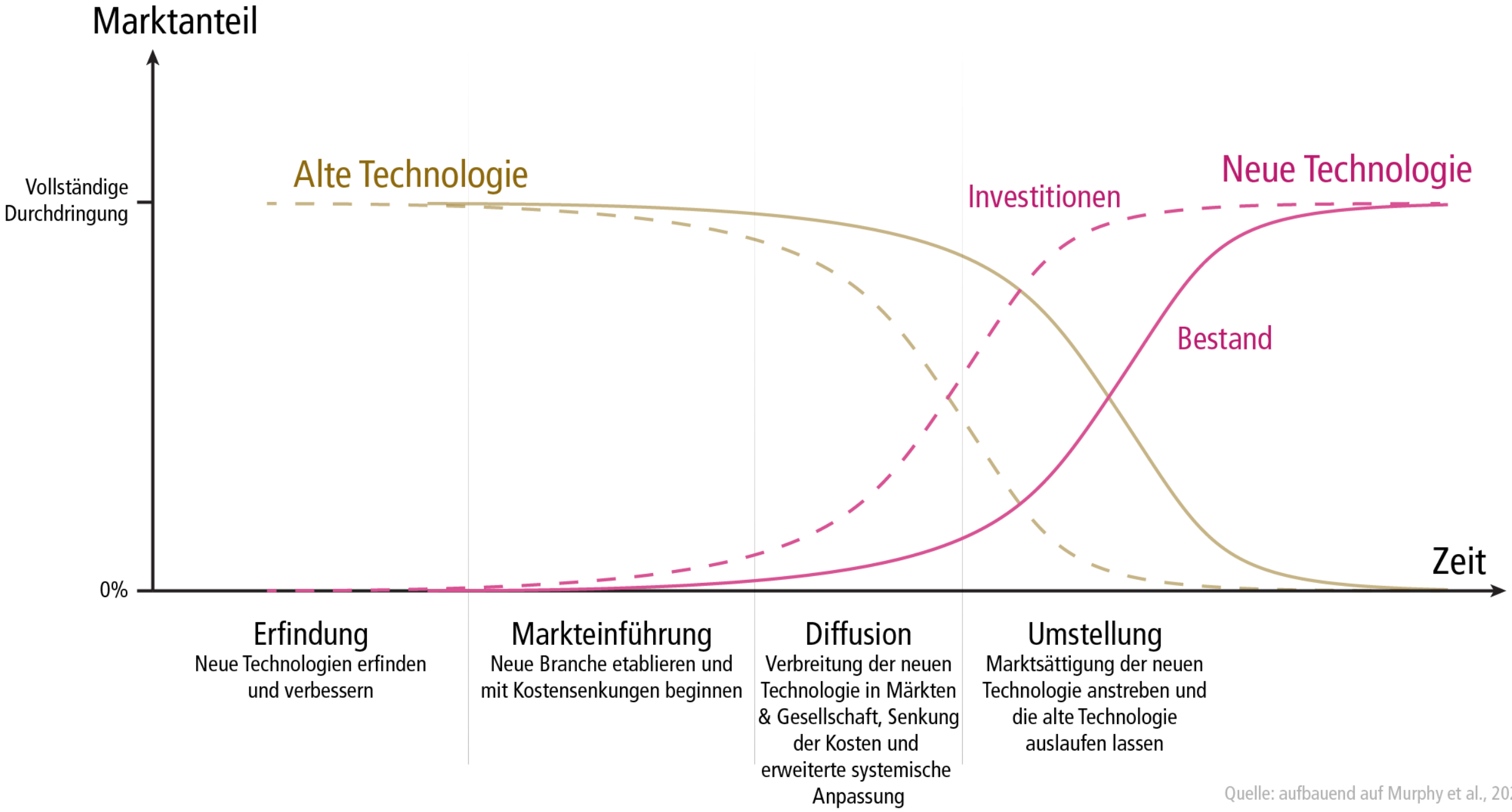
Erneuerbare Heizsysteme



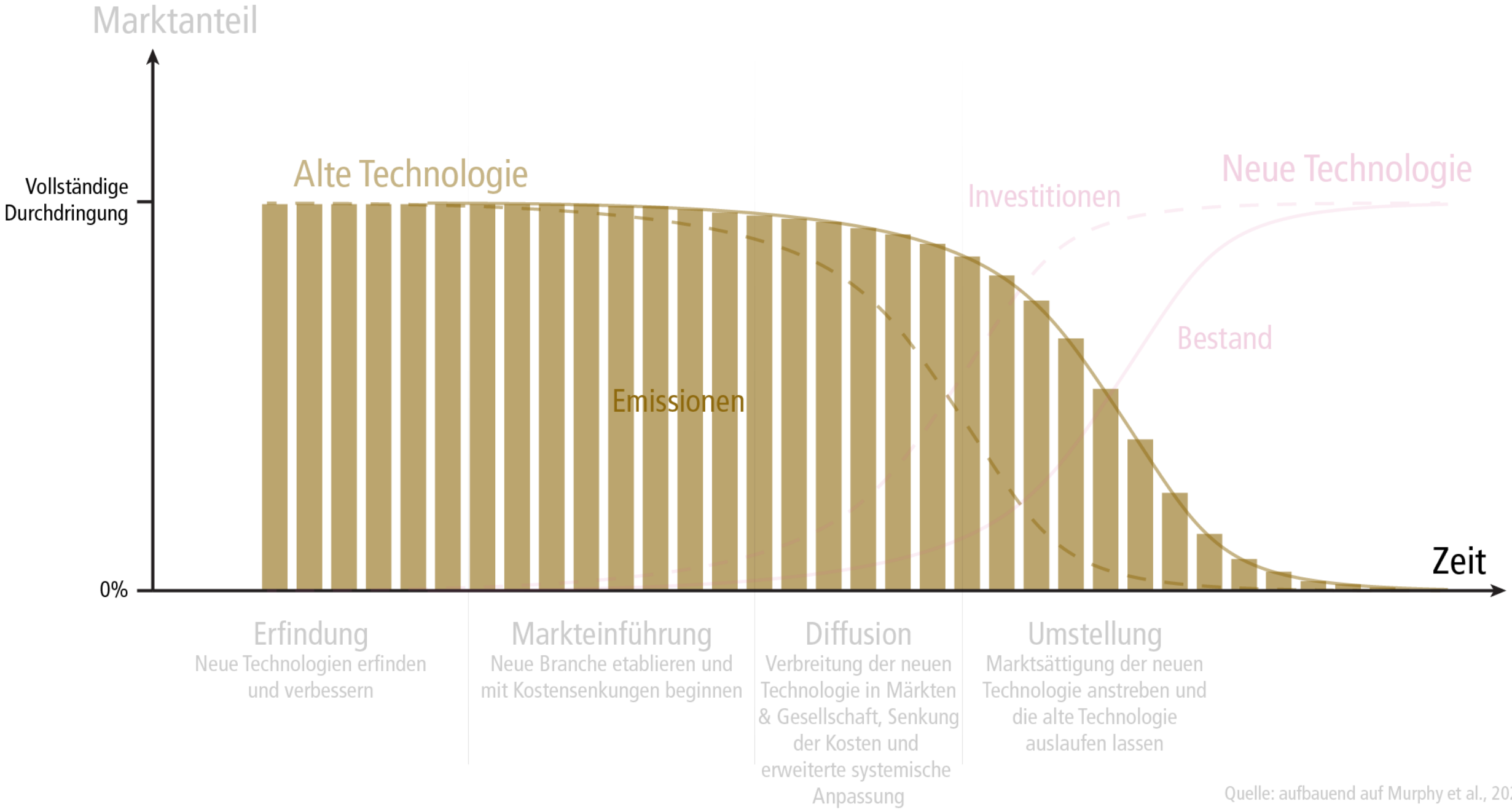




CO_2-arme Stromproduktion

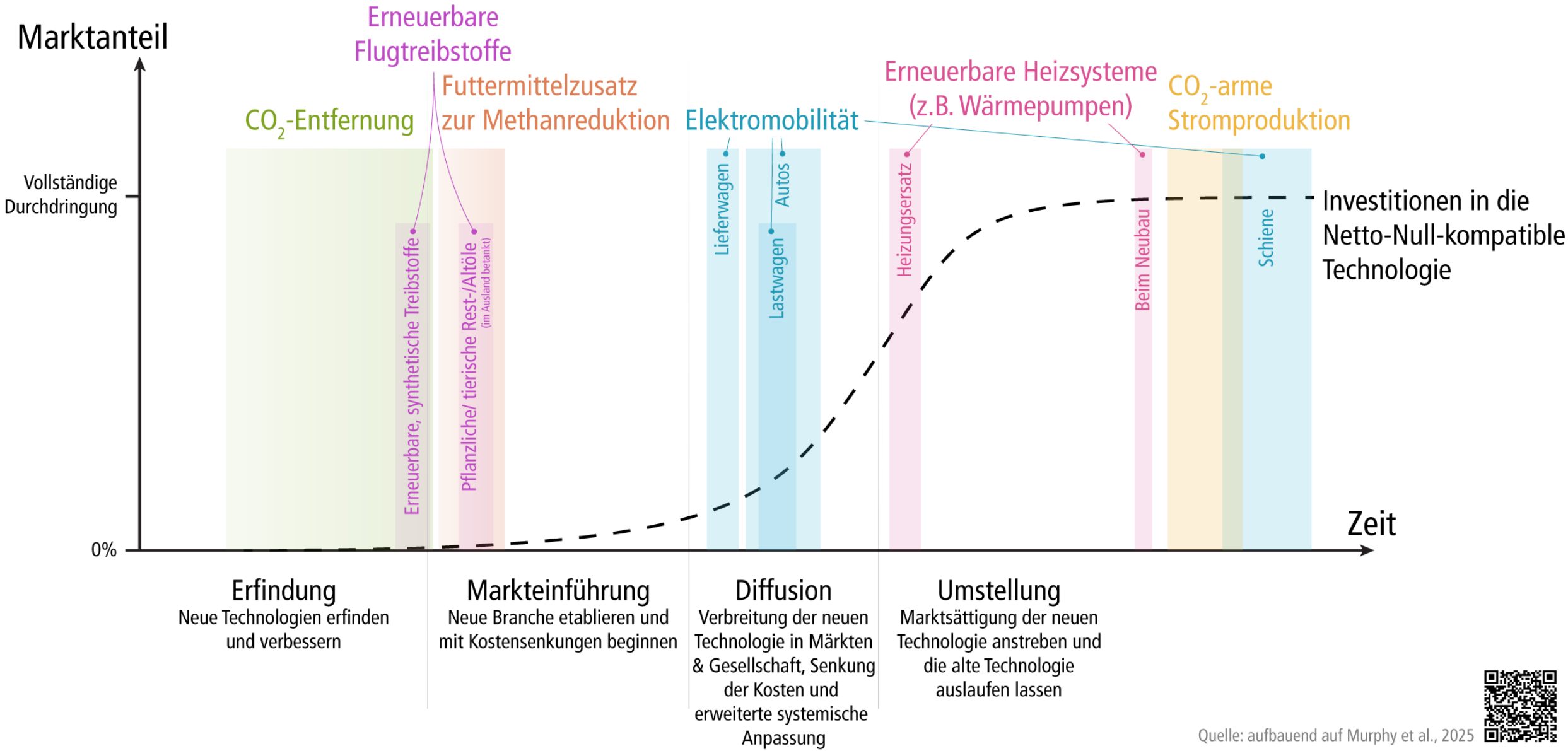


Quelle: aufbauend auf Murphy et al., 2025



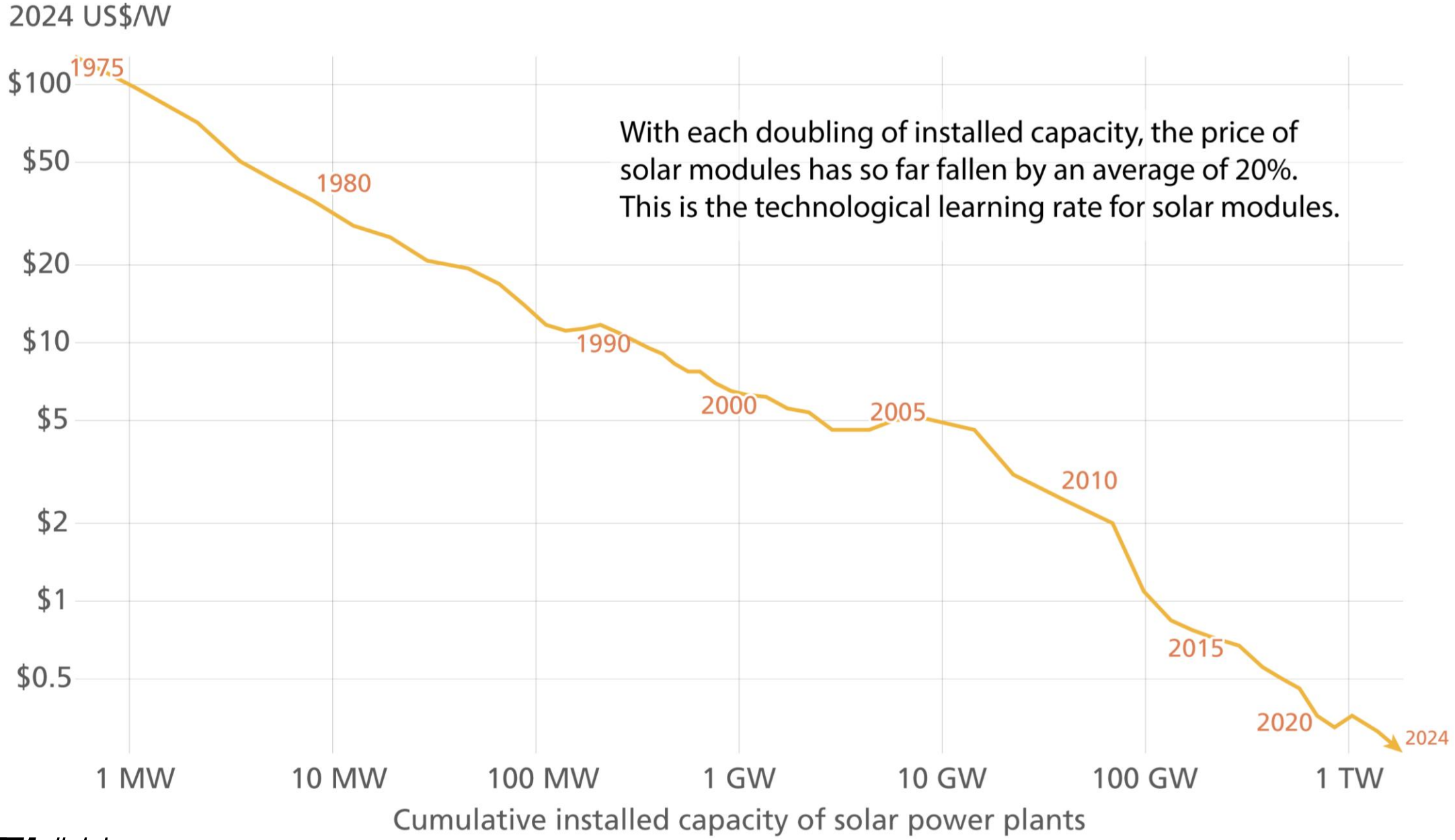
Quelle: aufbauend auf Murphy et al., 2025

Wo stehen verschiedene Technologien einer Netto-Null-Infrastruktur in der Schweiz?



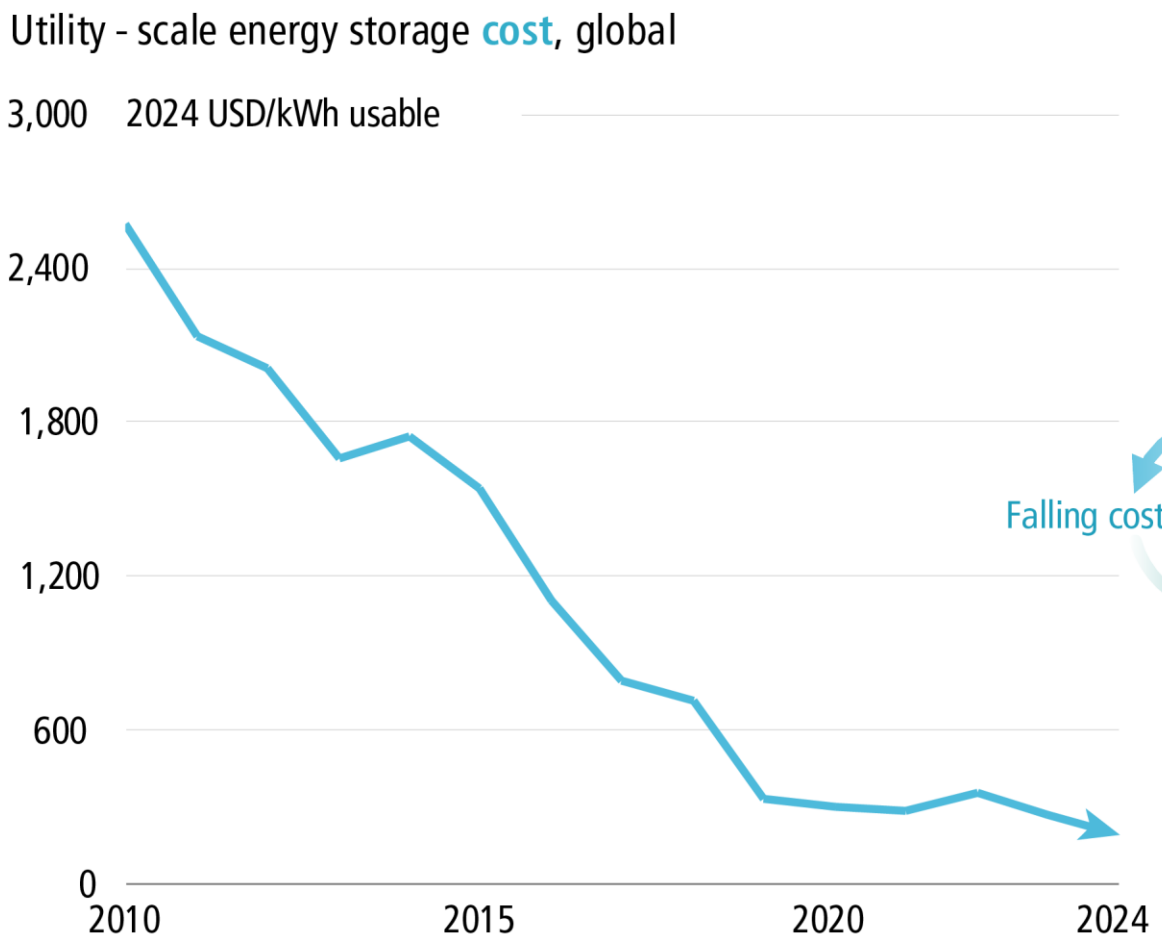
Quelle: aufbauend auf Murphy et al., 2025

Historical cost trends for solar cells



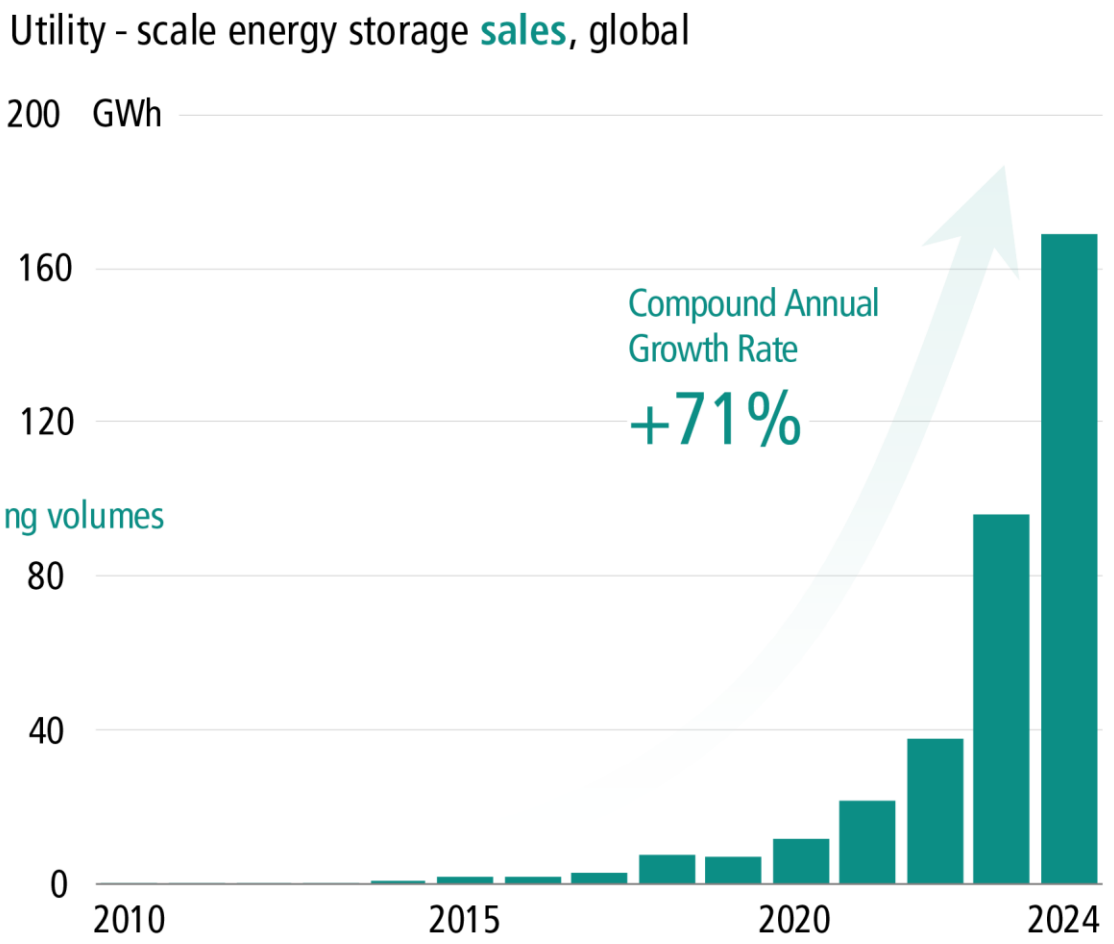
Source: Adopted from OurWorldInData.org; Data: RENA (2025); Nemet (2009); Farmer and Lafond (2016)

In some (many) cases, there are positive feedback loops



Falling costs

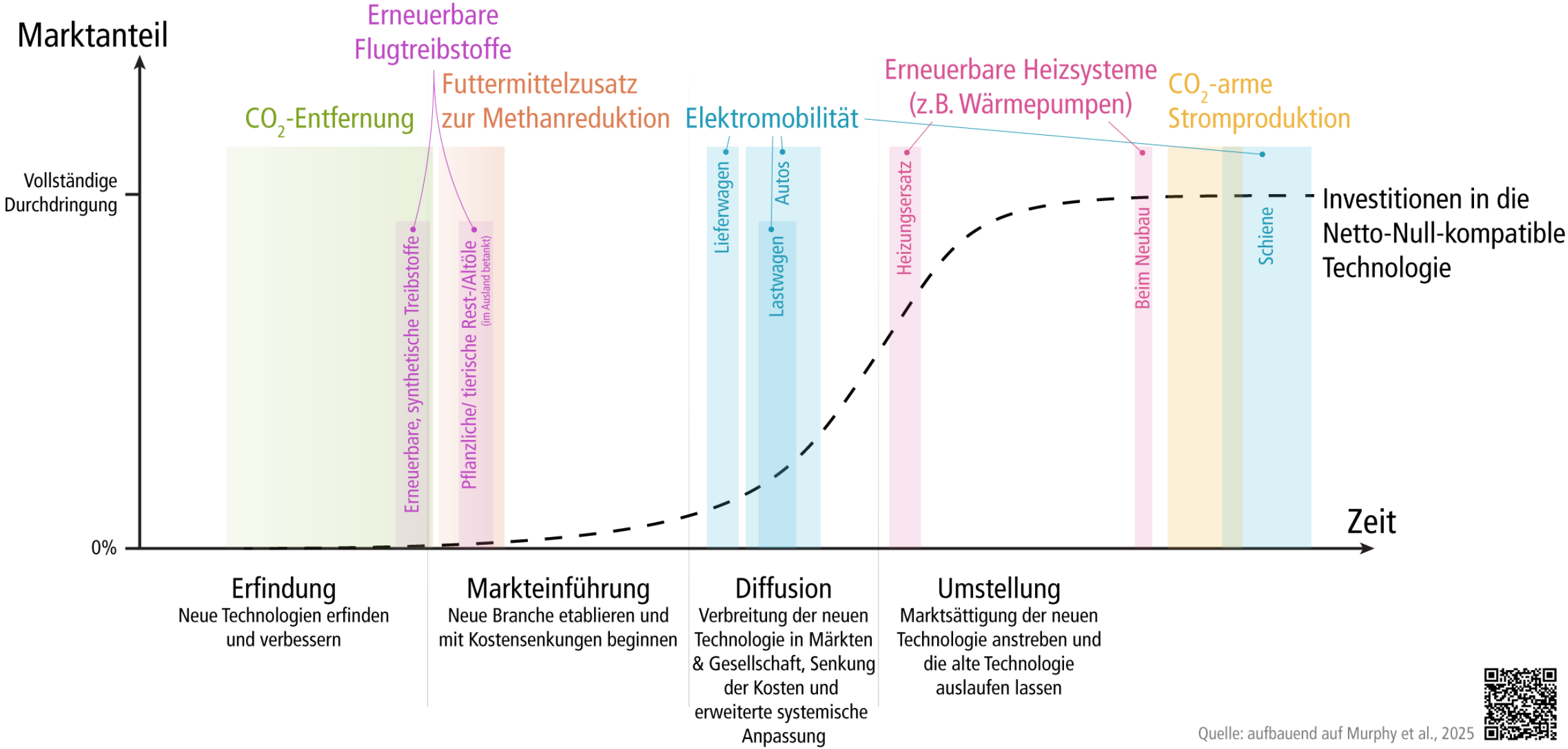
Rising volumes



Source: IRENA, EMBER (2026)


3
4
5
DIE POST
Sauber zugestellt.
Wir fahren elektrisch.

Wo stehen verschiedene Technologien einer Netto-Null-Infrastruktur in der Schweiz?



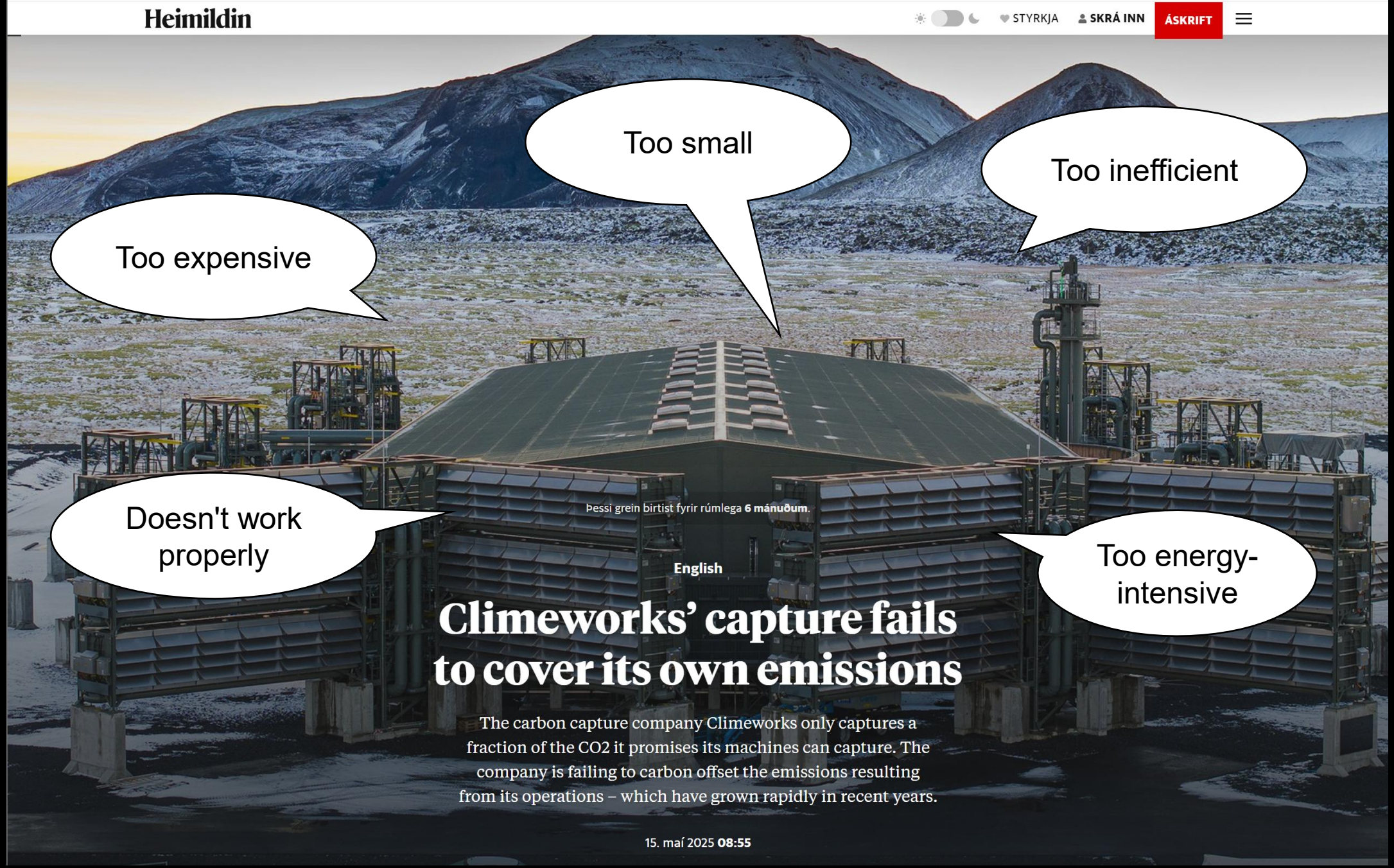
Quelle: aufbauend auf Murphy et al., 2025

Carbon Dioxide Removal (CDR) Methods

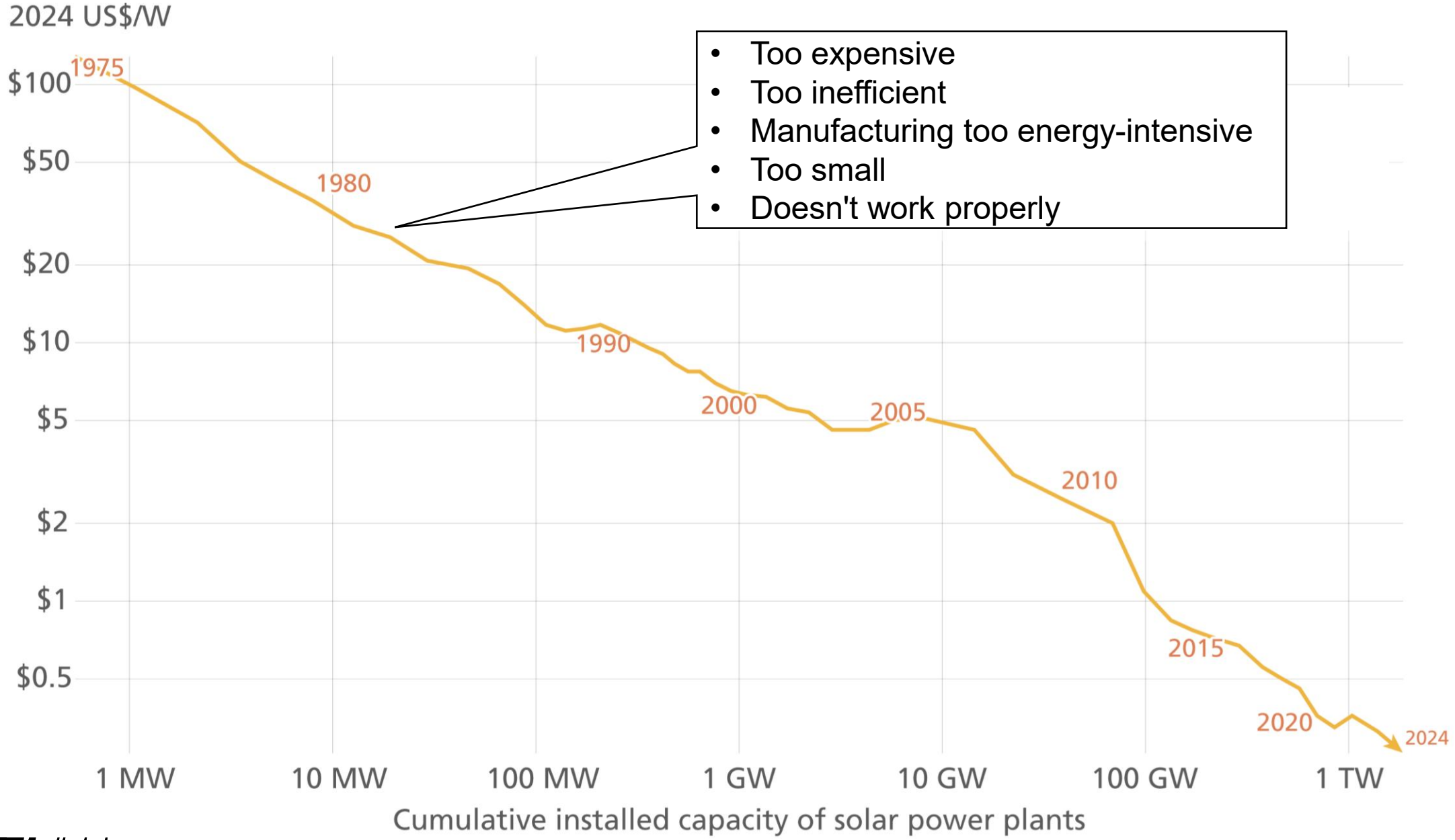


CDR Method	Afforestation, Reforestation, Improved Forest Management	Peatland & Wetland Restoration	Soil Carbon Sequestration	Biochar	Bio-oil injection	Direct Air Capture and Storage (DACS)	Bio-Energy Carbon Capture and Storage (BECCS)	Enhanced Rock Weathering	Carbonation of concrete	Solid Carbon Storage	Blue Carbon Management	Ocean Fertilisation	Marine Biomass Sinking	Ocean Alkalinity Enhancement	Electrochemical Ocean Capture and Storage
Timescale of Storage	–/o	–/o	–	o	+	+	+	+	+	o	–	o	o	+	+
Readiness	+	+	o	o	o	o	o	–	o	–	–	–	–	–	–
Potential ($GtCO_2$/yr)	2.2	0.5 to 2.1	0.6 to 9.3	0.3 to 6.6	-	5 to >10	0.5 to 11	2 - 4	0.3	-	>1	1 to 3	-	1 to >100	-
Measurement Reporting Verification	o	o	–	o	+	+	+	–	+	o	o	–	–	–	+
Demand for space	–	–	o	–	+	+	+	+	o	+	–	+	+	+	+
Demand for energy	o	o	o	+	+	–	+	–	o	+	o	?	o	–	–
Price (USD/tCO_2) in 2024	10-50	?	0-80	165	510	490	227	360	560	-	10-50	66-160	250	470	1300
Expected cost development	↗	?	?	↗	↘	↘	↘	↘	↘	?	?	?	?	→	↘

Sources: Minx et al. (2017), IPCC AR6 (2022); Ten New Insights in Climate Science 2023/2024

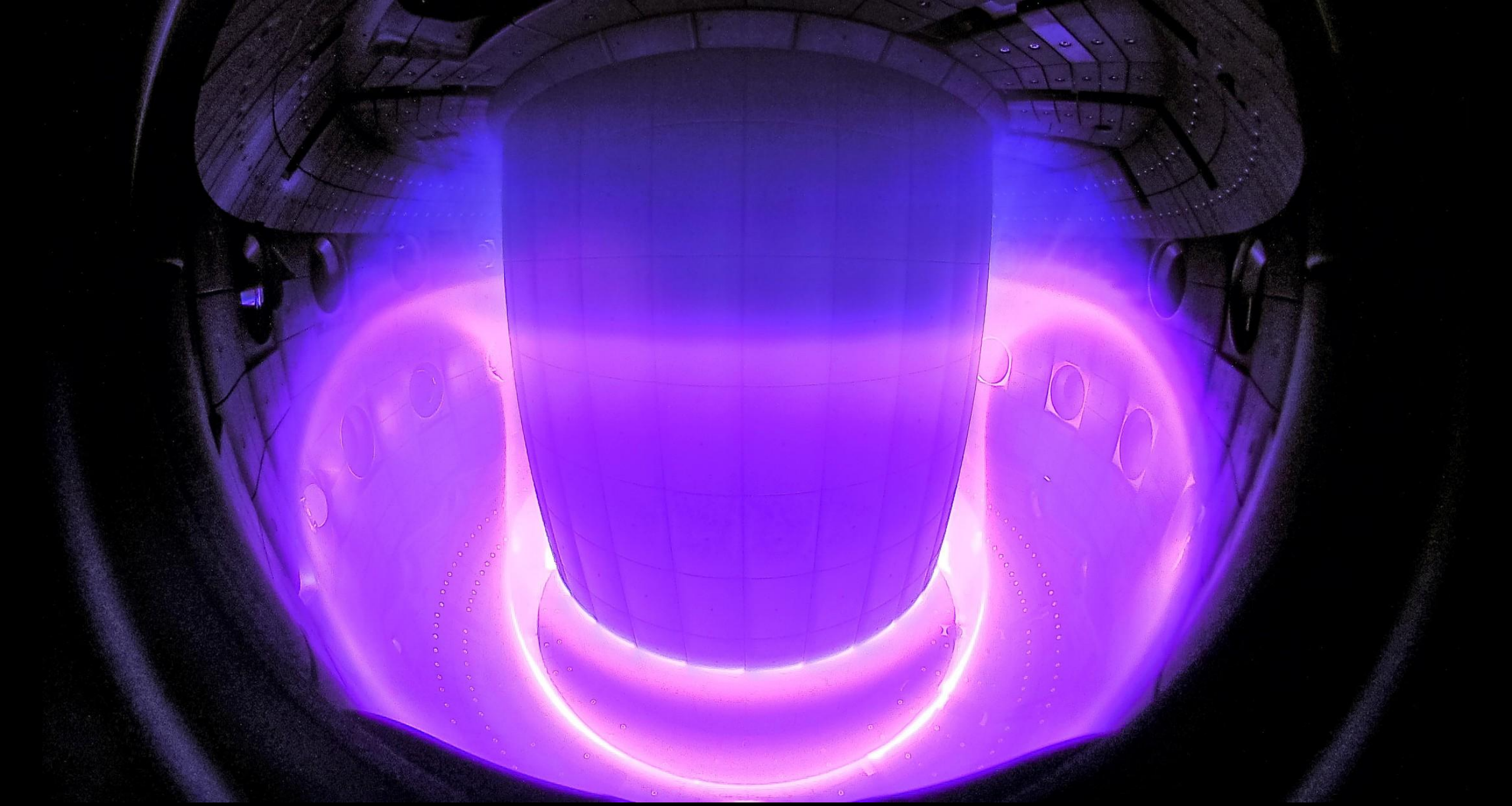

Heimildin
STYRKJA
SKRÁ INN
ÁSKRIFT
Too small
Too inefficient
Too expensive
Doesn't work properly
Too energy-intensive
Þessi grein birtist fyrir rúmlega 6 mánuðum.
English
Climeworks' capture fails to cover its own emissions
The carbon capture company Climeworks only captures a fraction of the CO2 it promises its machines can capture. The company is failing to carbon offset the emissions resulting from its operations – which have grown rapidly in recent years.
15. maí 2025 08:55

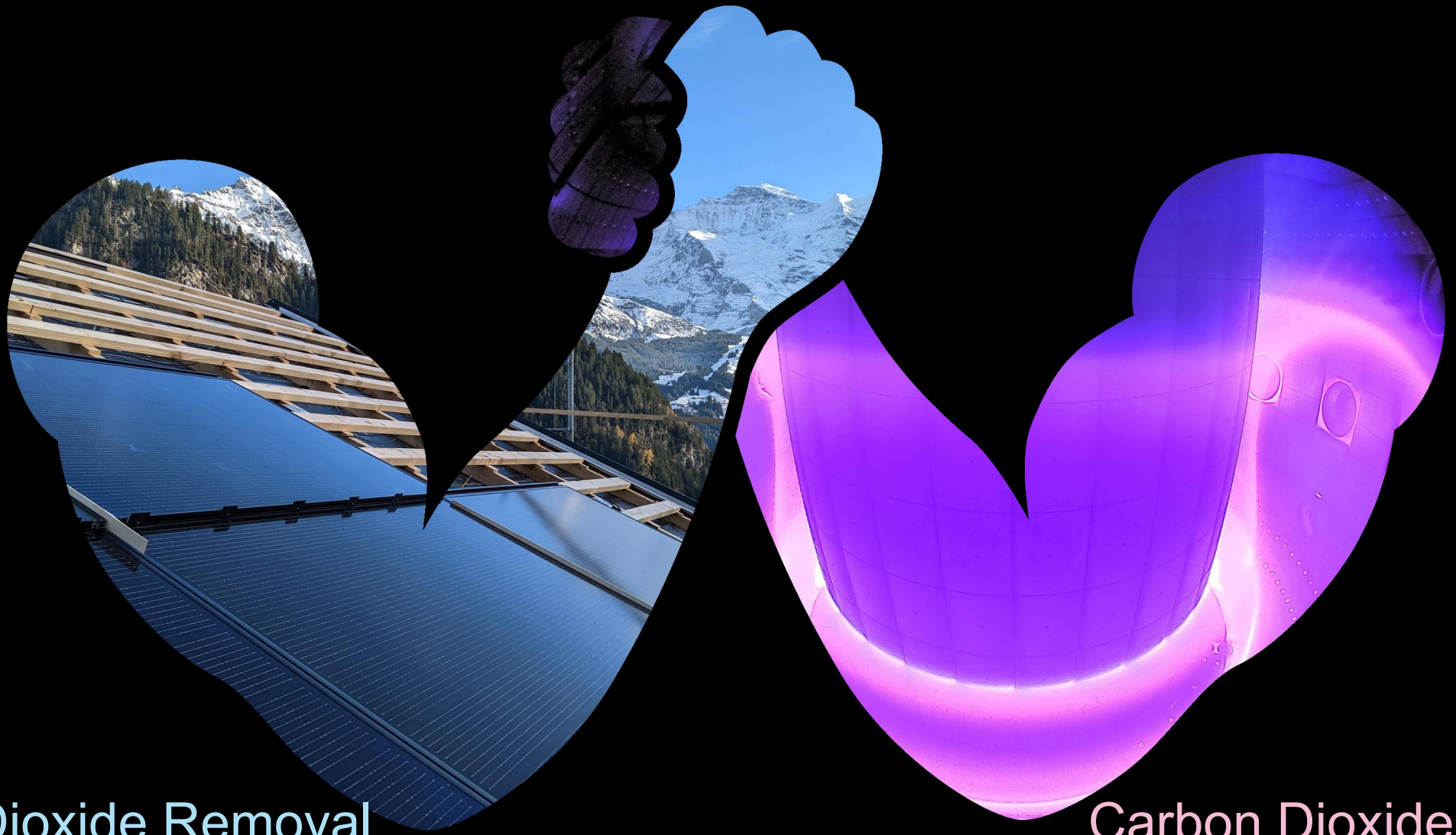
Historical cost trends for solar cells



- Too expensive
- Too inefficient
- Manufacturing too energy-intensive
- Too small
- Doesn't work properly

Source: Adopted from OurWorldInData.org; Data: RENA (2025); Nemet (2009); Farmer and Lafond (2016)





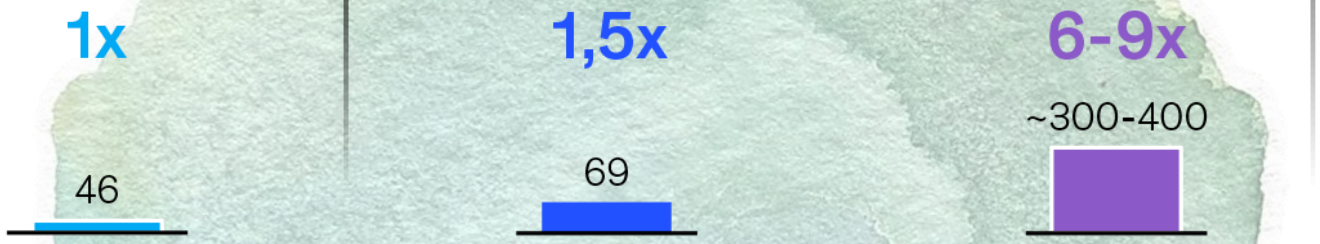
Carbon Dioxide Removal
is one of the solutions.

Carbon Dioxide Removal
is just a distraction from
reducing emissions

Der Einfluss der Schweiz auf die globalen Treibhausgasemissionen

Geltungsbereich der Schweizer Verpflichtungen
Pariser Abkommen

Geltungsbereich Science-Based Targets Initiative (SBTi)



1a. Die inländischen Emissionen

1b. Importbedingte Emissionen

2. Aus der Schweiz kontrollierte Emissionen

CO_2-Gesetz + Klima-/Innovations-gesetz

Grenzausgleichsystem für CO_2-Emissionen

3. Emissionen im Zusammenhang mit Finanzflüssen aus der Schweiz:
Investitionen in Aktien, Unternehmensanleihen und Kredite

+ Investitionen in Staatsanleihen
(hohe Schätzungs-unsicherheit)

□ Mt CO_2e (2019)

Quelle: McKinsey, Economie Suisse und WWF (2022)

Summary part I:
If I was in your shoes regarding the “Vorbildrolle”

The “easy” part:

- Electrify your heating and transportation.
- Support your customers in doing the same.

The harder part:

- Help avoid emissions from carbon in wood.
- If you go for concrete, which is a valid option, go for low carbon cement & steel where available
- Stewardship with funds you manage
- If you aim to buy carbon dioxide removal (which you need for net zero), rather buy less but from a technology that is scalable (which is currently expensive).
- If there is any air travel, purchase tickets with (100%) sustainable aviation fuel

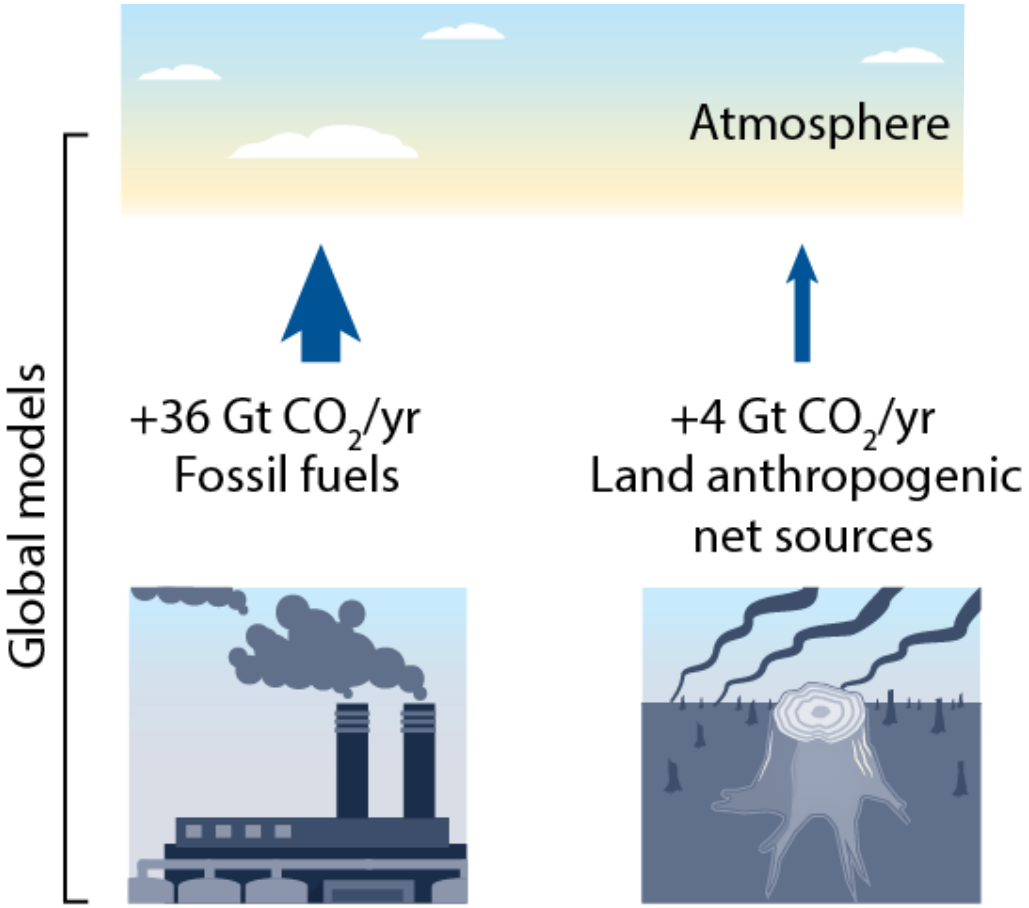
Climate action and biodiversity conservation

What are the main drivers of biodiversity loss? (globally)

What are the main drivers of biodiversity loss? (globally)

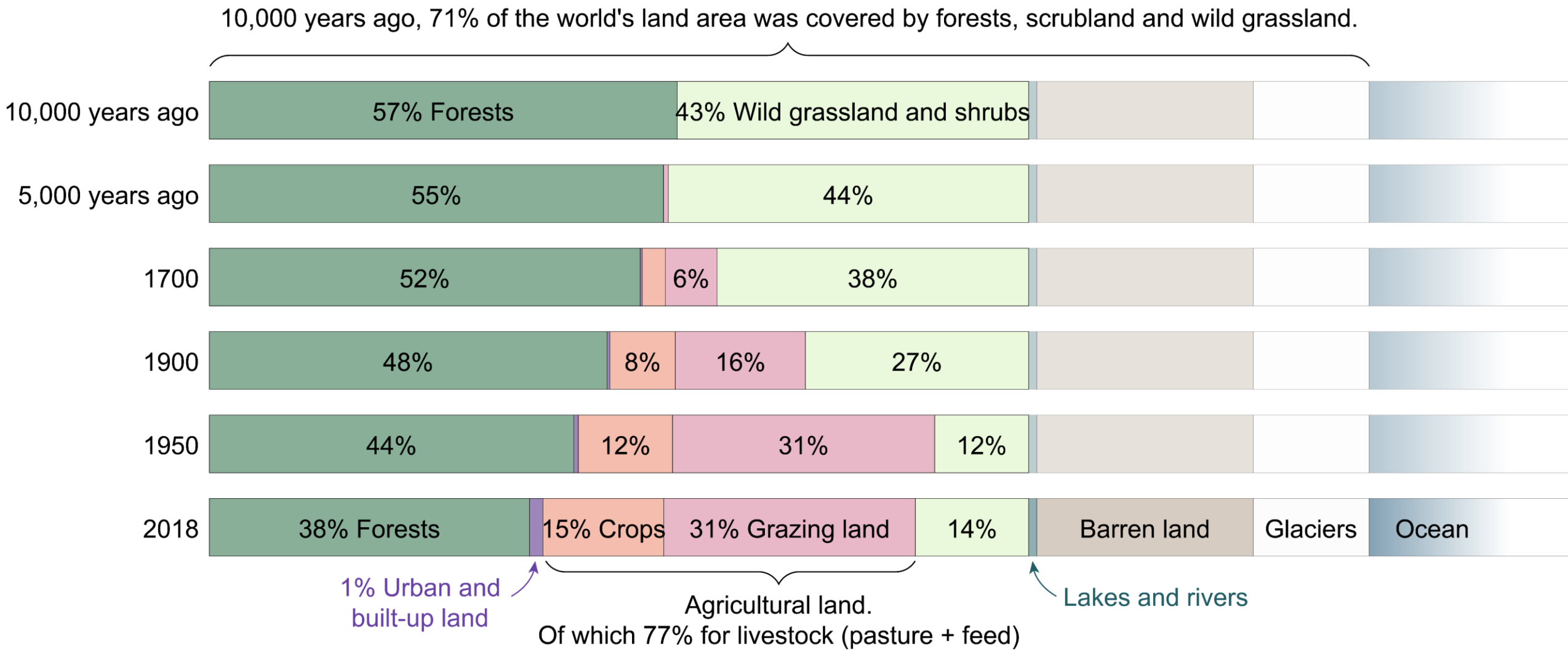
- Land-use change and the resulting habitat loss (→ mainly for pasture, farmland and plantations, coastal development)
- Direct overexploitation (overfishing, unsustainable logging, hunting, wildlife trade)
- Climate change
- Pollution (fertilizers, pesticides, plastics, light and noise)
- Invasive species

Countries and climate science count greenhouse gas emissions differently



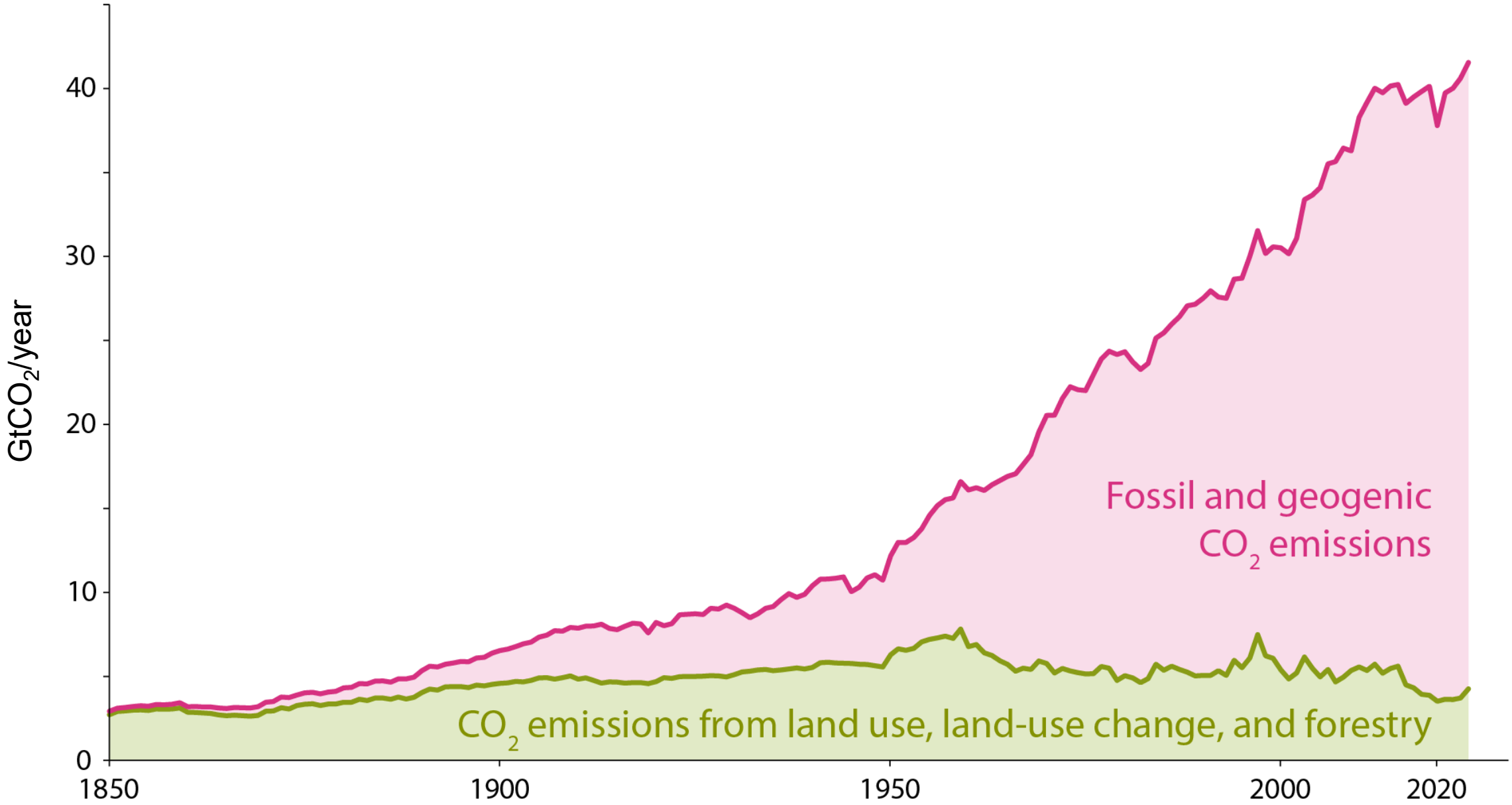
Source: Grassi et al. (2025)

Land use change over time



Source: adopted from OurWorldInData.org; Williams (2003); HYDE; FAO

Global CO_2 emissions



Source: Friedlingsstein et al. (2024)

Fall Colors in August



Wie sollen wir Holz künftig einsetzen?









Summary part II:
If I was in your shoes regarding the “Vorbildrolle”

The “easy” part:

- Electrify your heating and transportation.
- Support your customers in doing the same.

The harder part:

- Help avoid emissions from carbon in wood.
  - Forests are under pressure - due to increased wood use (including burning) and climate change. A shift in thinking is needed.
  - Wood has many uses, but it can’t do everything. Decarbonizing cement and steel production, along with the circular economy, is likely to be key.
- If you go for concrete, which is a valid option, go for low carbon cement & steel where available
- Stewardship with funds you manage
- If you aim to buy carbon dioxide removal (which you need for net zero), rather buy less but from a technology that is scalable (which is currently expensive).
- If there is any air travel, purchase tickets with (100%) sustainable aviation fuel

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