IE UNIVERSITY
CENTER FOR WATER AND CLIMATE ADAPTATION

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Escalando experiencias de economía circular para la seguridad hídrica y la adaptación al cambio climático

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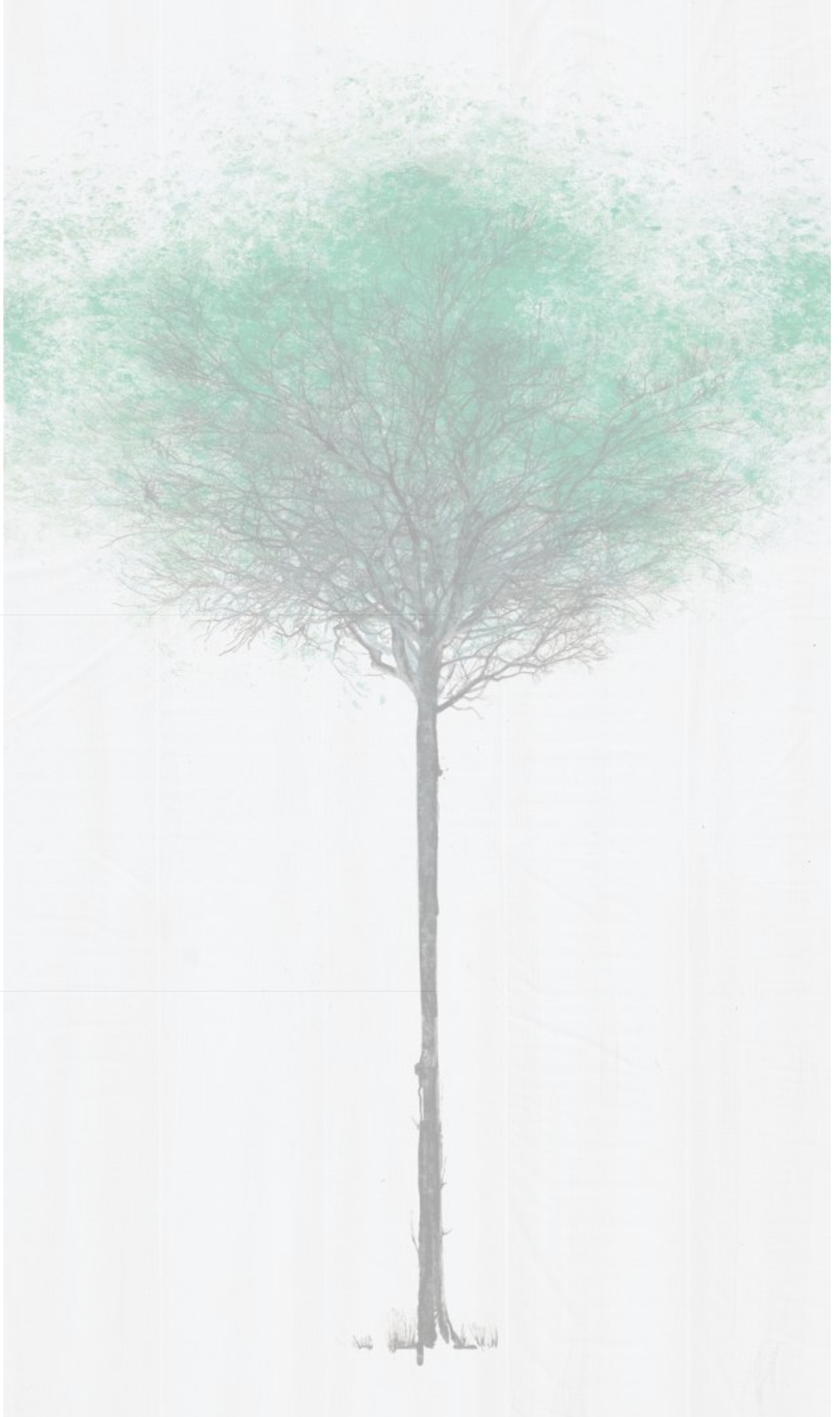
GOBIERNO DE ESPAÑA | MINISTERIO DE CIENCIA E INNOVACIÓN

EMASESA metropolitana

PROYECTO MITLOP

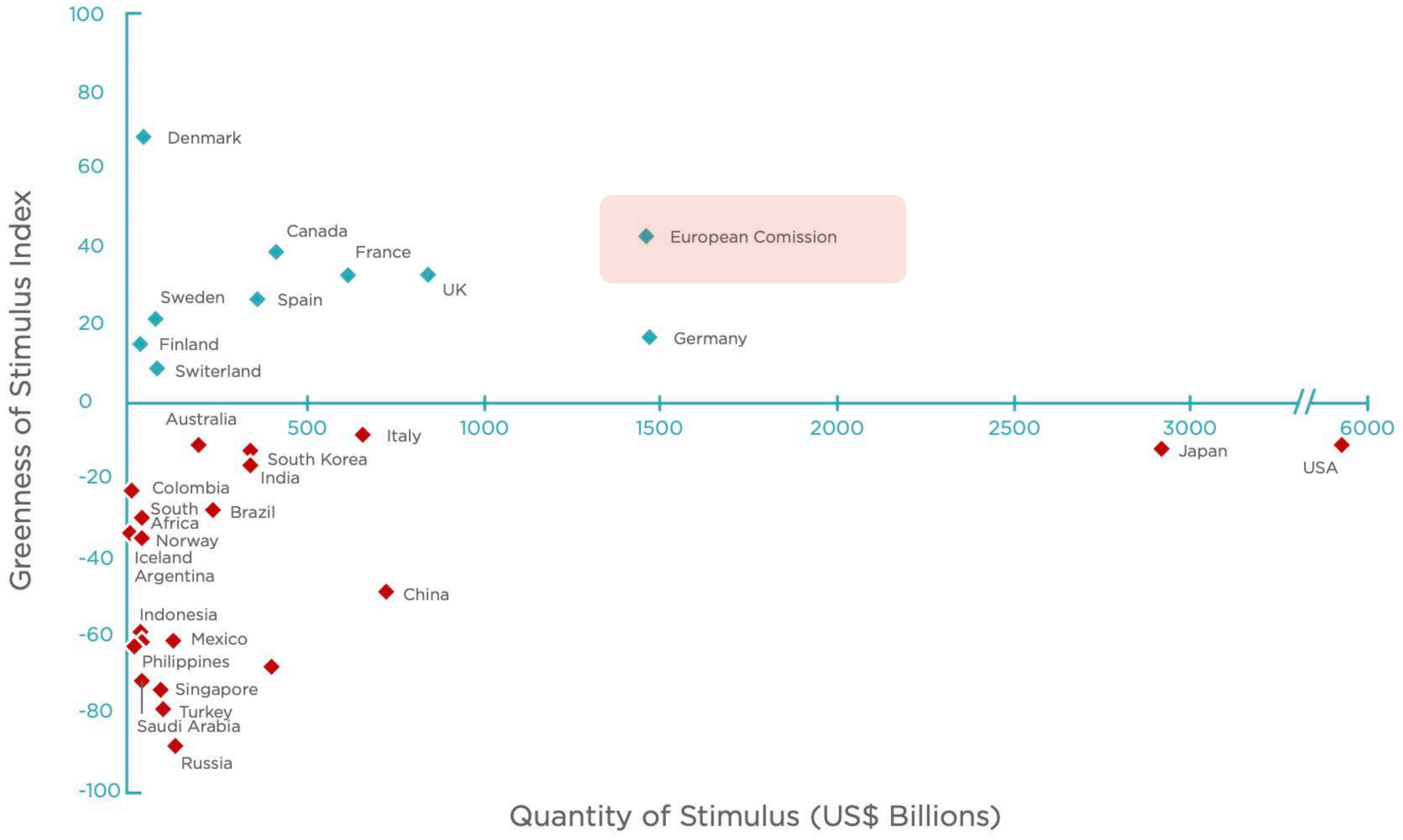
UNIÓN EUROPEA

Fondo Europeo de Desarrollo Regional
Una manera de hacer Europa



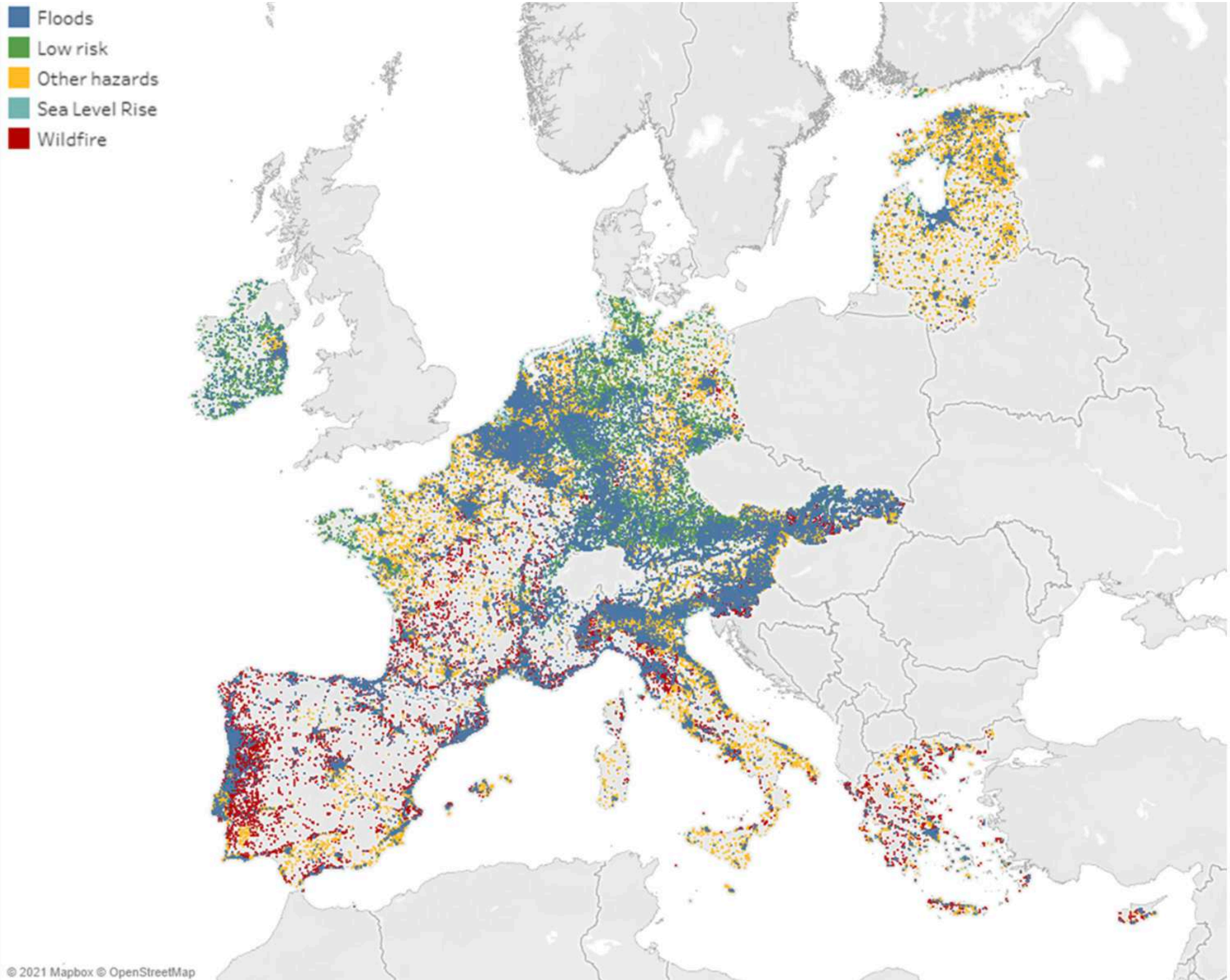
Jody Xiong of DDB China

Riesgos Globales. WEF 2022



Source: Vivid Economics using IMF Policy Tracker and other sources
Note: Updated on 30 June 2021.

Los riesgos climáticos ya no son evaluados por activistas, sino incluso por autoridades monetarias.



Agenda Events Reports Platforms

WORLD ECONOMIC FORUM

Global Agenda | The Davos Agenda 2021 | How to Save the Planet | Climate Change

Why sustainability is the new digital

Businesses that ignore the environmental concerns of their investors and consumers will get left behind. Image: Jcomp, Freepik

13 Jan 2021

This article is part of the The Davos Agenda

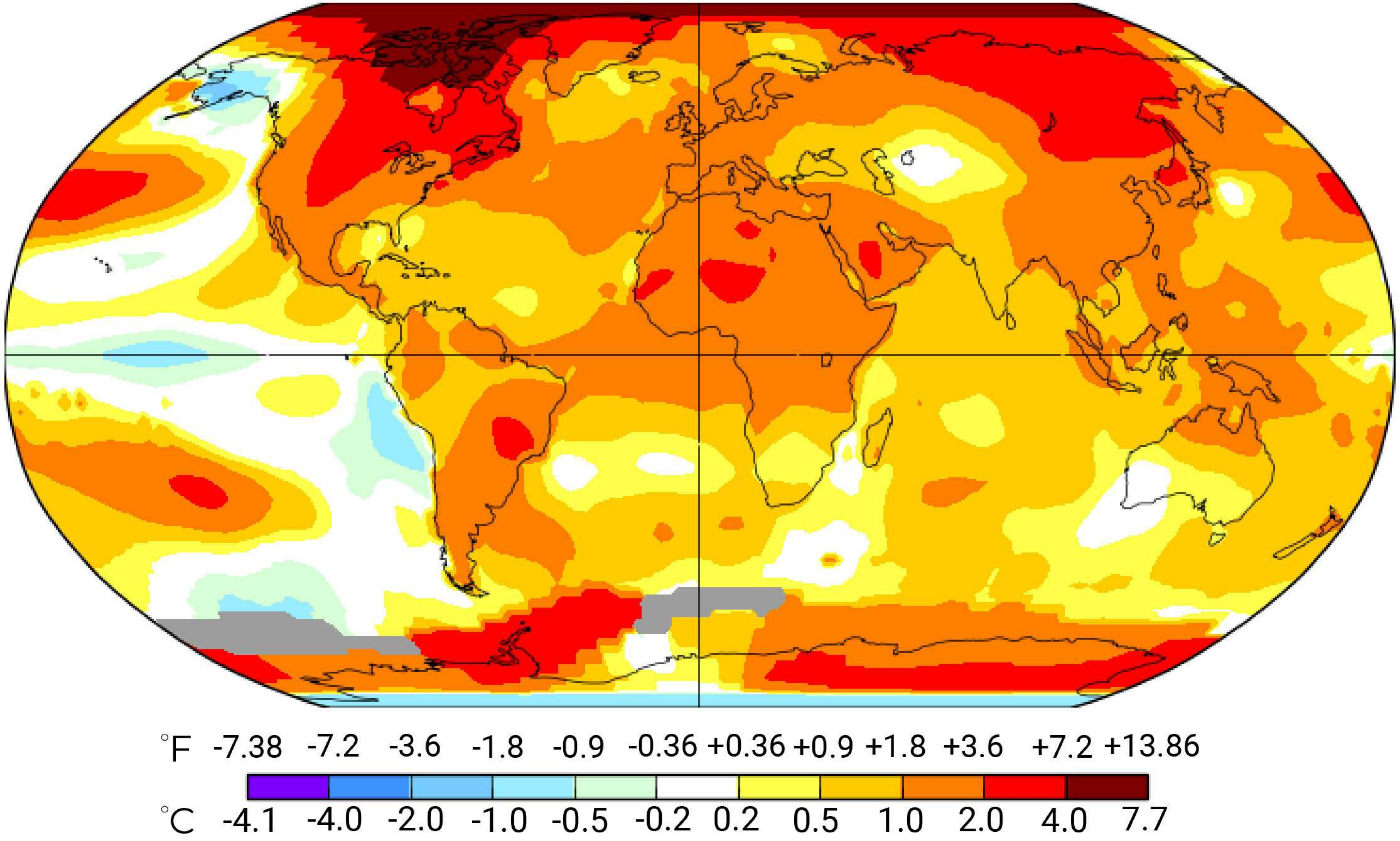
August 2022

McKinsey Quarterly

Does ESG really matter—and why?

Cambio climático, evidencia robusta y relato mejorable

Global Average Temperature Changes (August 2022): 0.96°C/1.73°F



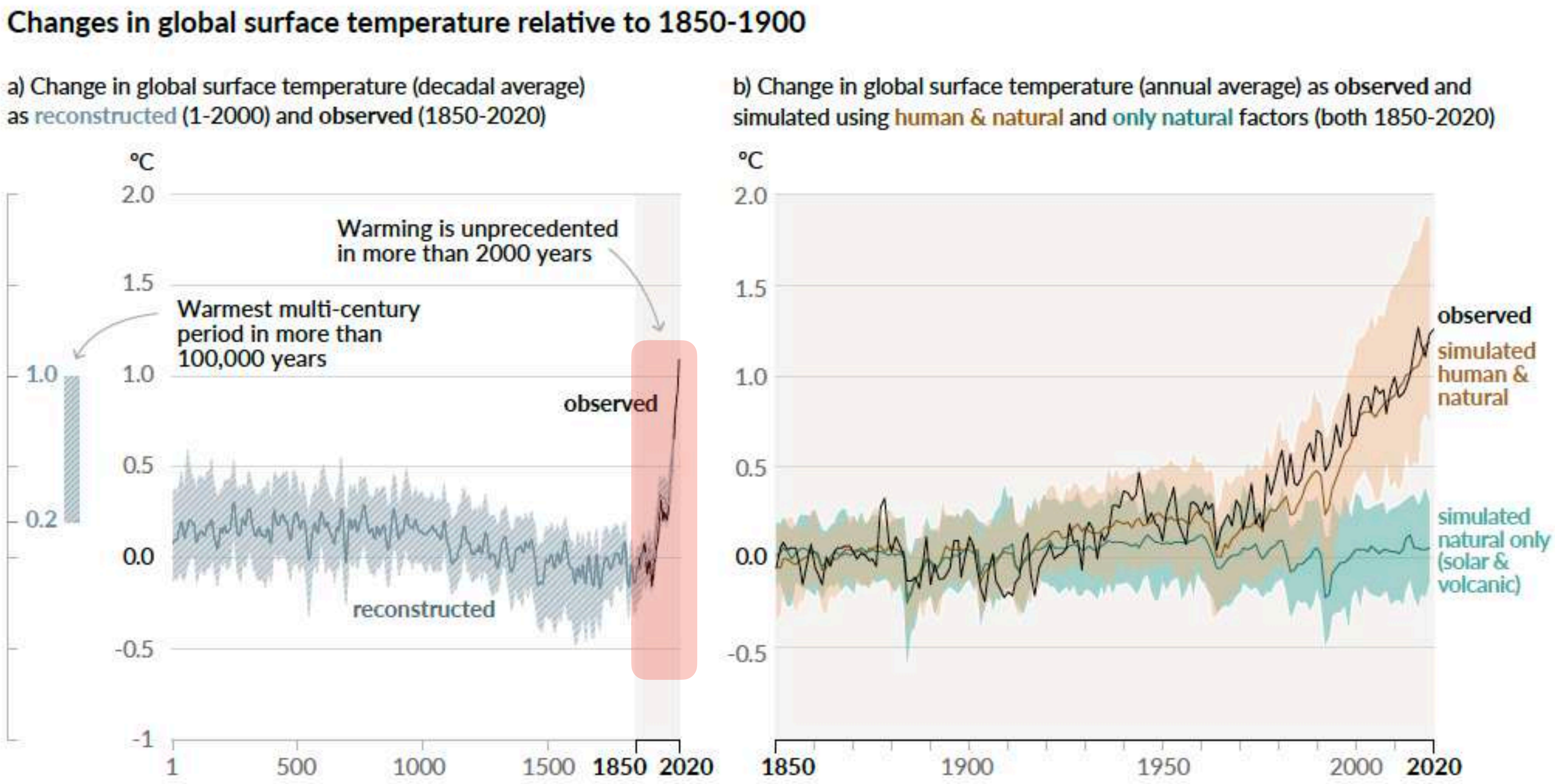
Notes:

- Gray areas signify missing data.
- Ocean data are not used over land nor within 100 kilometers (about 60 miles) of a reporting land station.
- These temperatures are in reference to NASA's 1951-1980 baseline.

CLIMATE.NASA.GOV

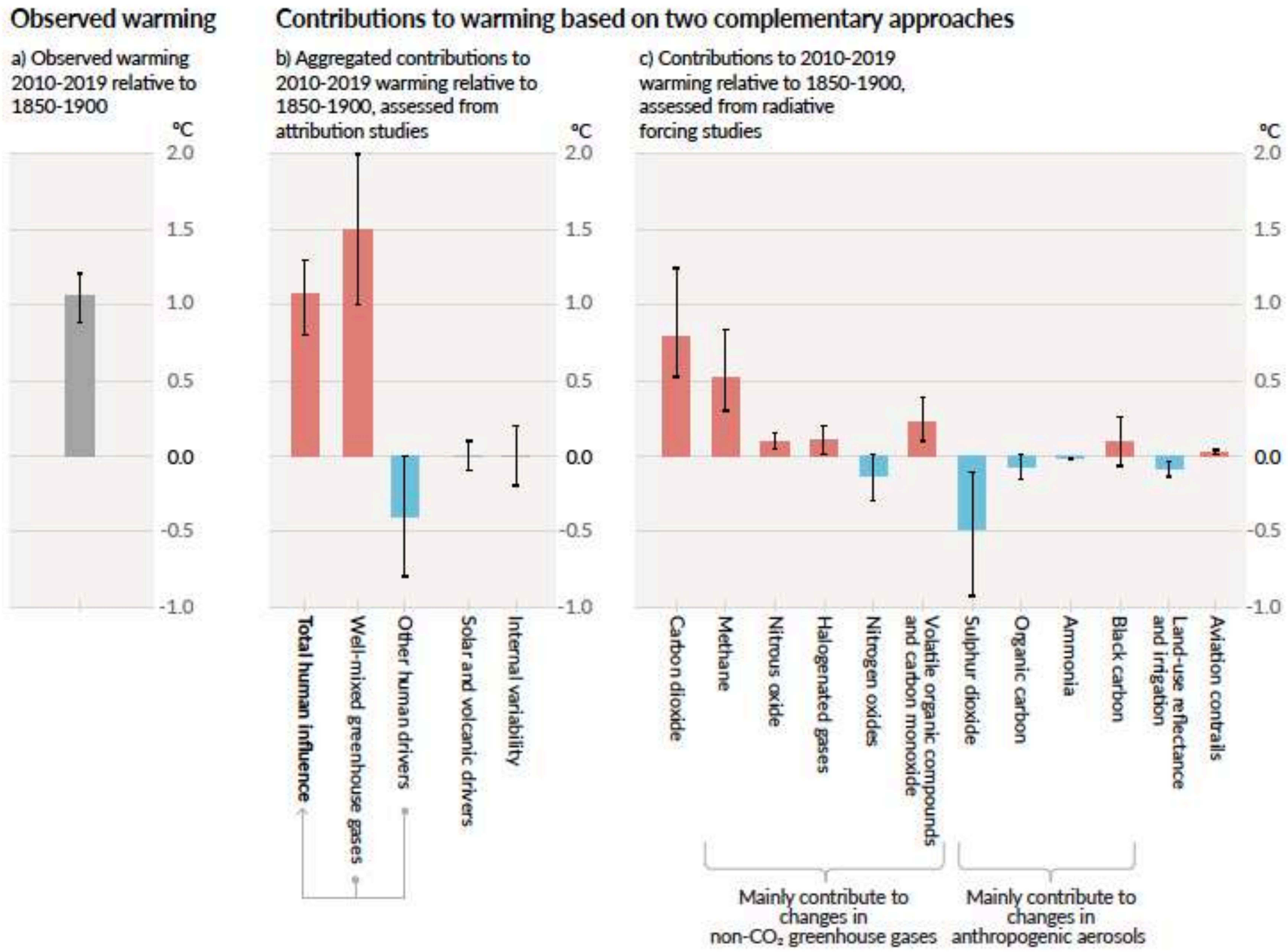
NASA/GISS/GISTEMP v4

La influencia humana ha calentado el clima a un ritmo sin precedentes en los últimos 2000 años



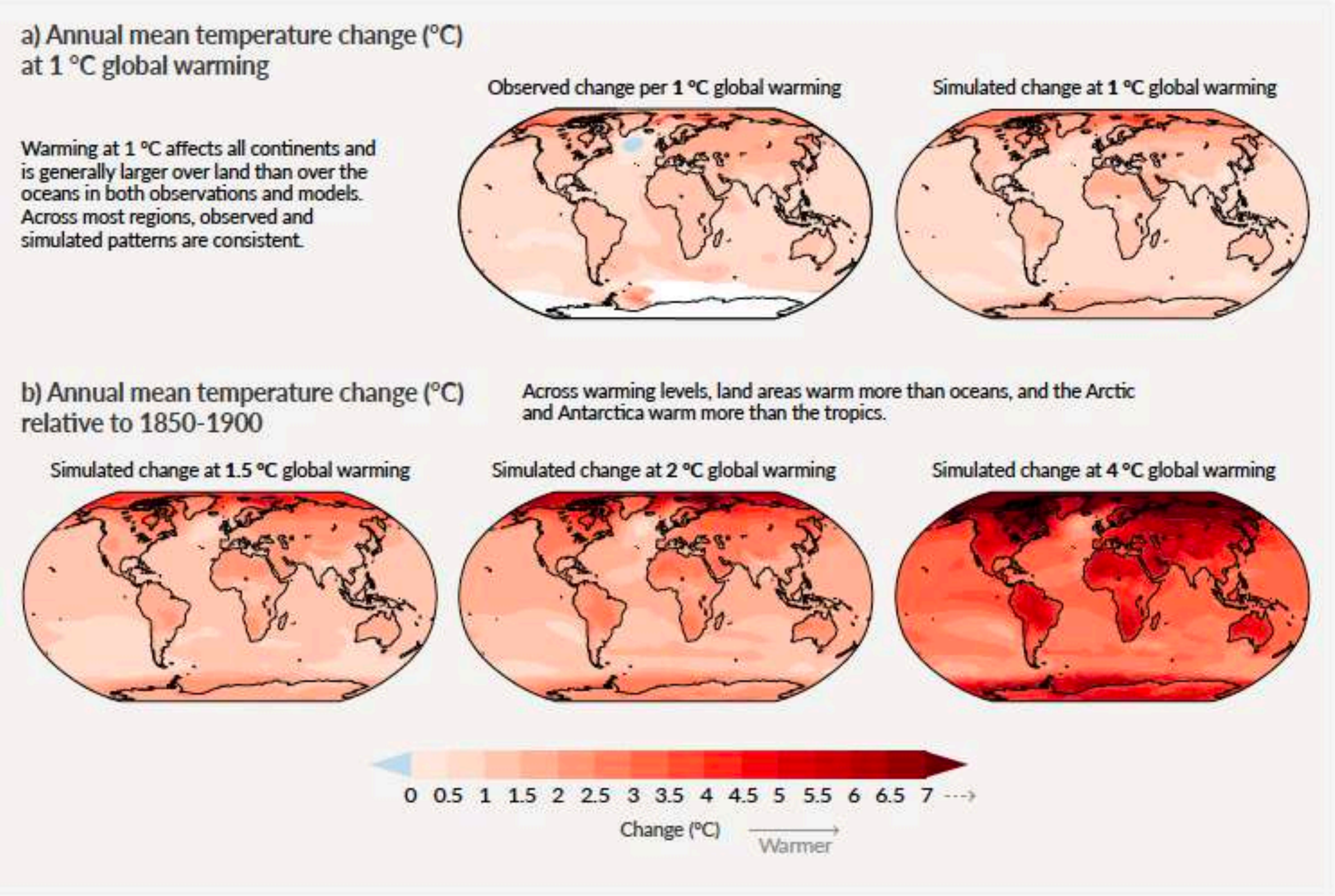
Zhongming, Z., Linong, L., Wangqiang, Z., & Wei, L. (2021). AR6 Climate Change 2021: The Physical Science Basis.

El calentamiento observado está ocasionado por emisiones de actividades humanas



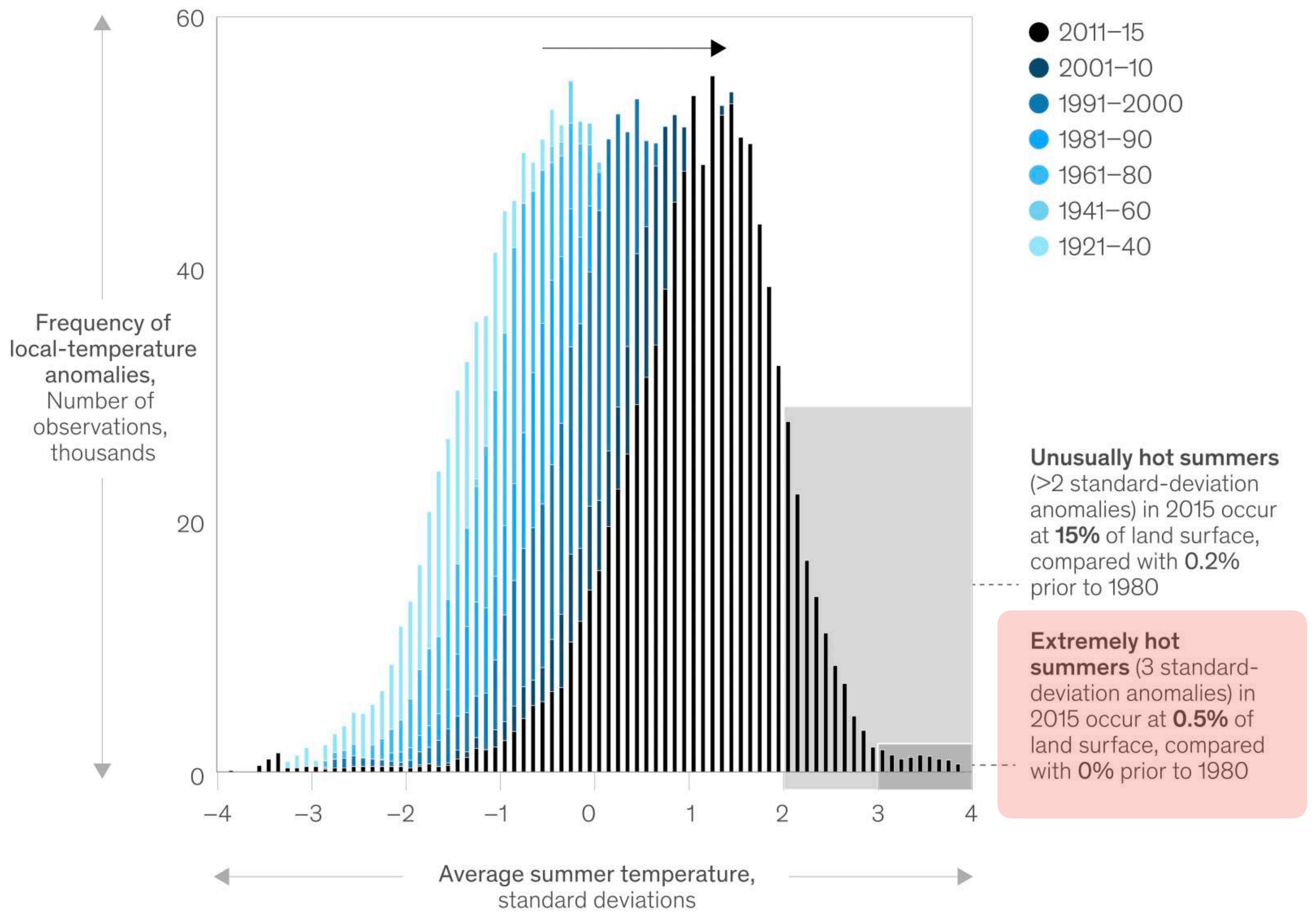
Zhongming, Z., Linong, L., Wangqiang, Z., & Wei, L. (2021). AR6 Climate Change 2021: The Physical Science Basis.

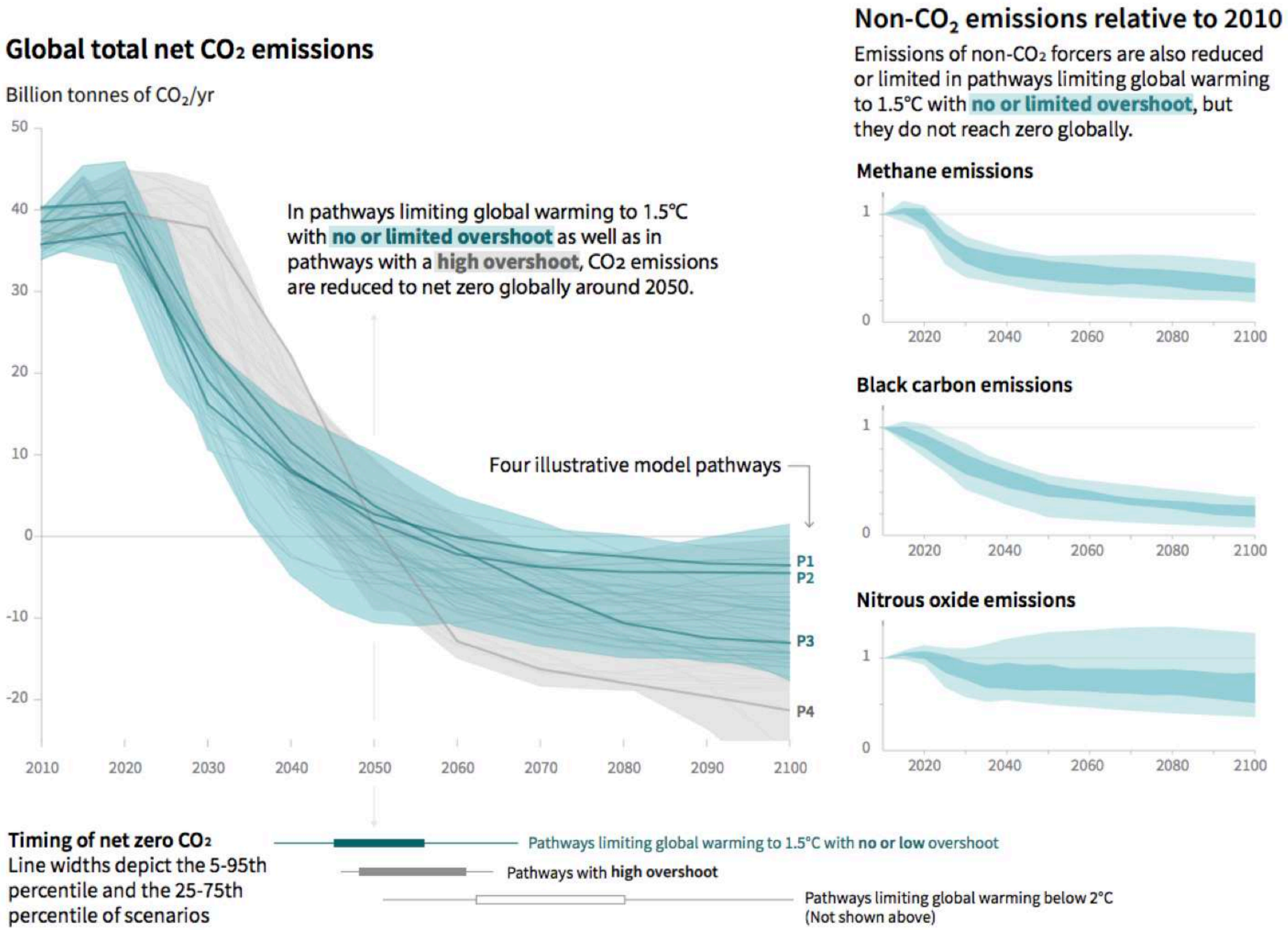
Con cada incremento del calentamiento global, observamos cambios proporcionalmente mayores en la temperatura media, las precipitaciones y la humedad del suelo a nivel regional.



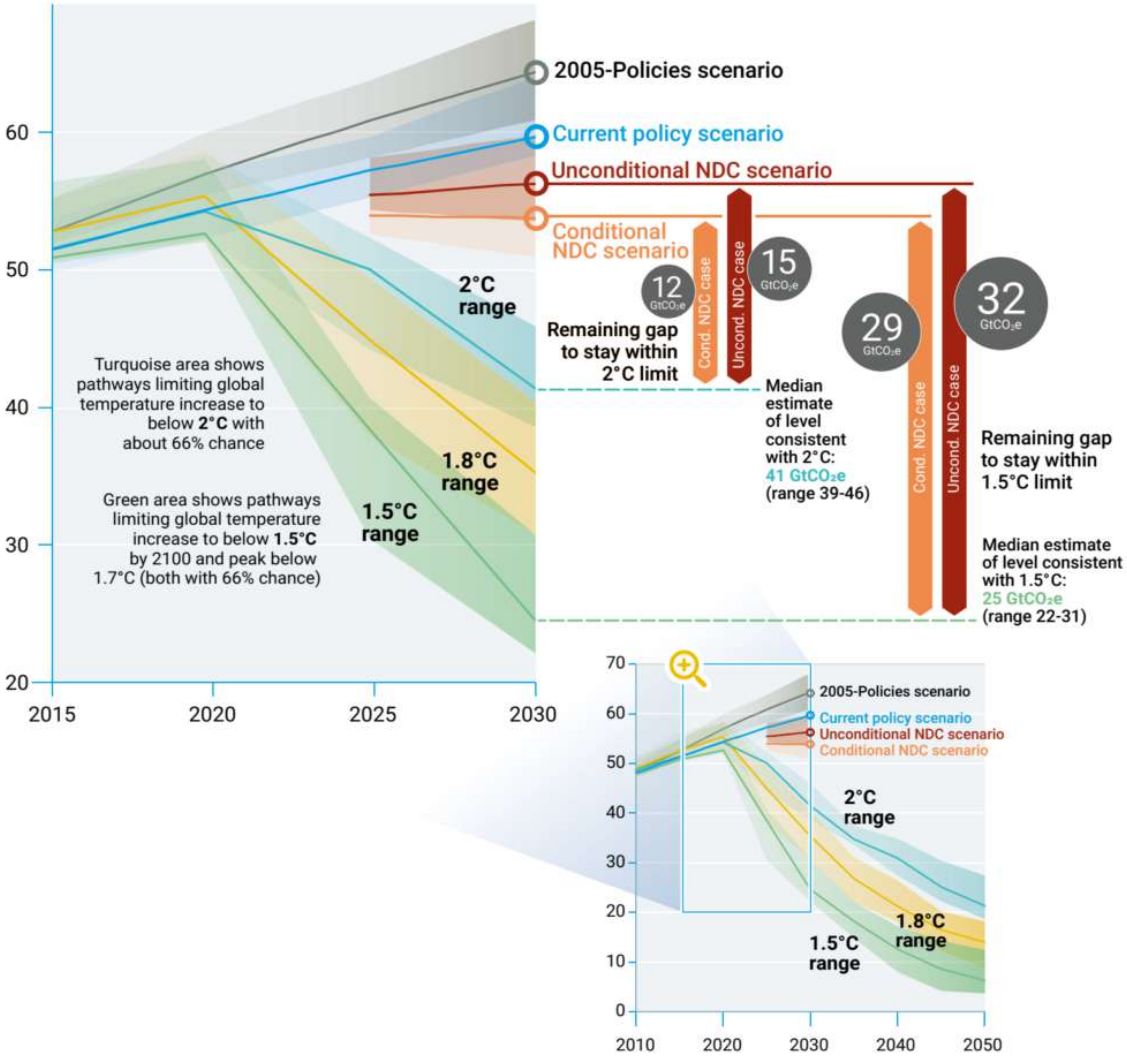
Zhongming, Z., Linong, L., Wangqiang, Z., & Wei, L. (2021). AR6 Climate Change 2021: The Physical Science Basis.

Northern Hemisphere summer-temperature shift

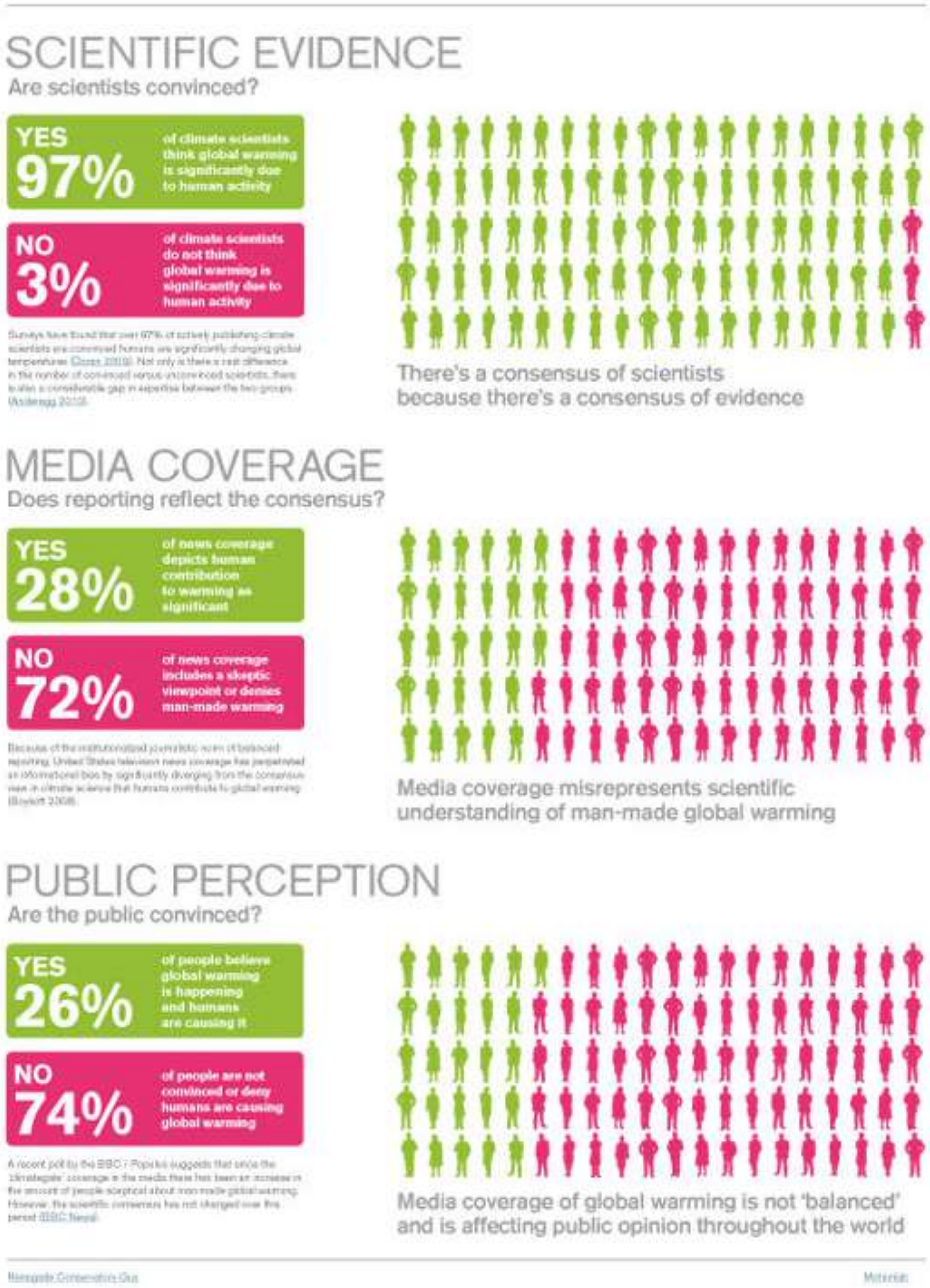


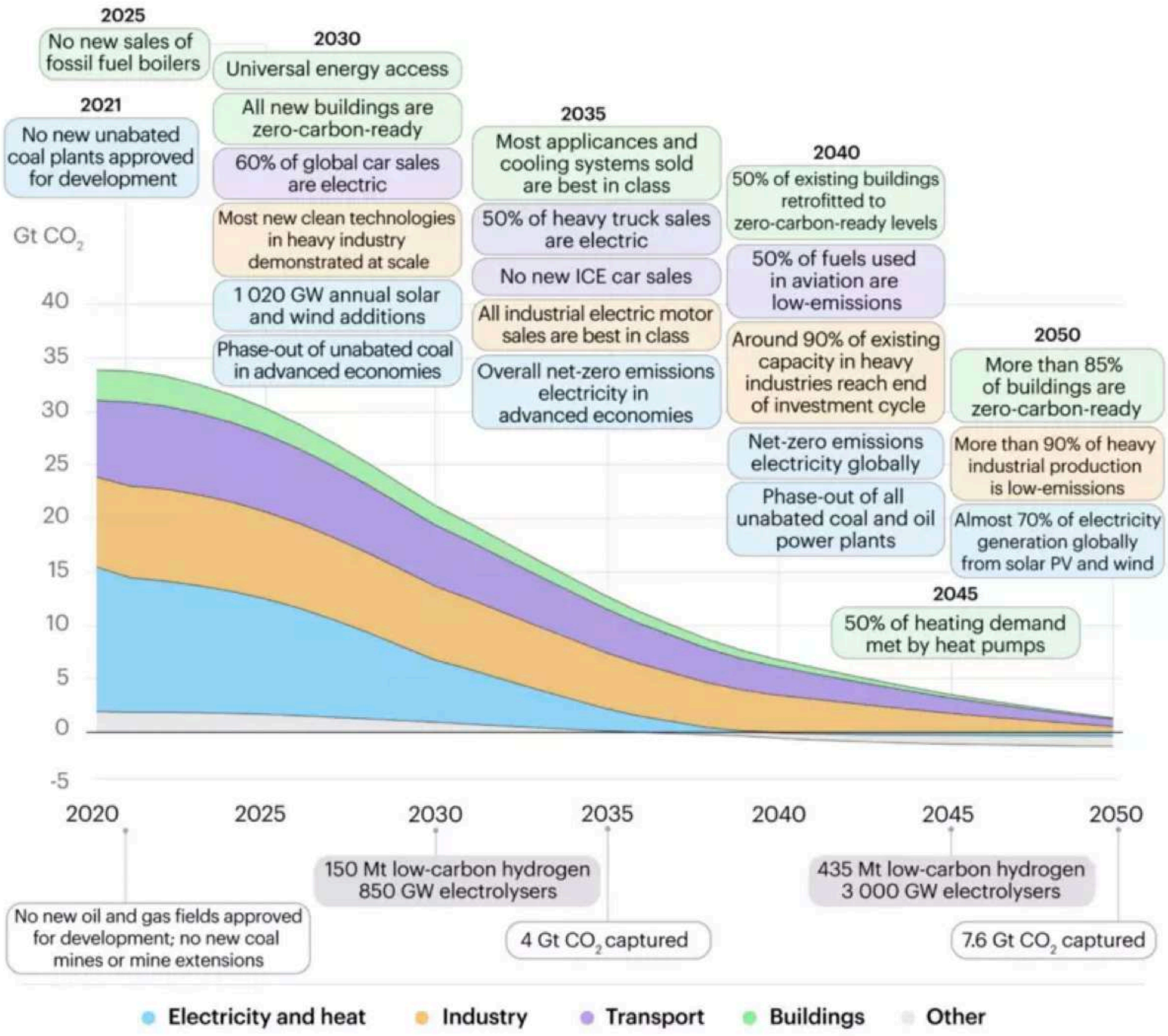


Global total net CO2 emissions
Billion tonnes of CO2/yr
50
40
30
20
10
0
-10
-20
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
In pathways limiting global warming to 1.5°C with no or limited overshoot as well as in pathways with a high overshoot, CO2 emissions are reduced to net zero globally around 2050.
Four illustrative model pathways
P1
P2
P3
P4
Non-CO2 emissions relative to 2010
Emissions of non-CO2 forcers are also reduced or limited in pathways limiting global warming to 1.5°C with no or limited overshoot, but they do not reach zero globally.
Methane emissions
Black carbon emissions
Nitrous oxide emissions
1
0
2020
2040
2060
2080
2100
Timing of net zero CO2
Line widths depict the 5-95th percentile and the 25-75th percentile of scenarios
Pathways limiting global warming to 1.5°C with no or low overshoot
Pathways with high overshoot
Pathways limiting global warming below 2°C (Not shown above)

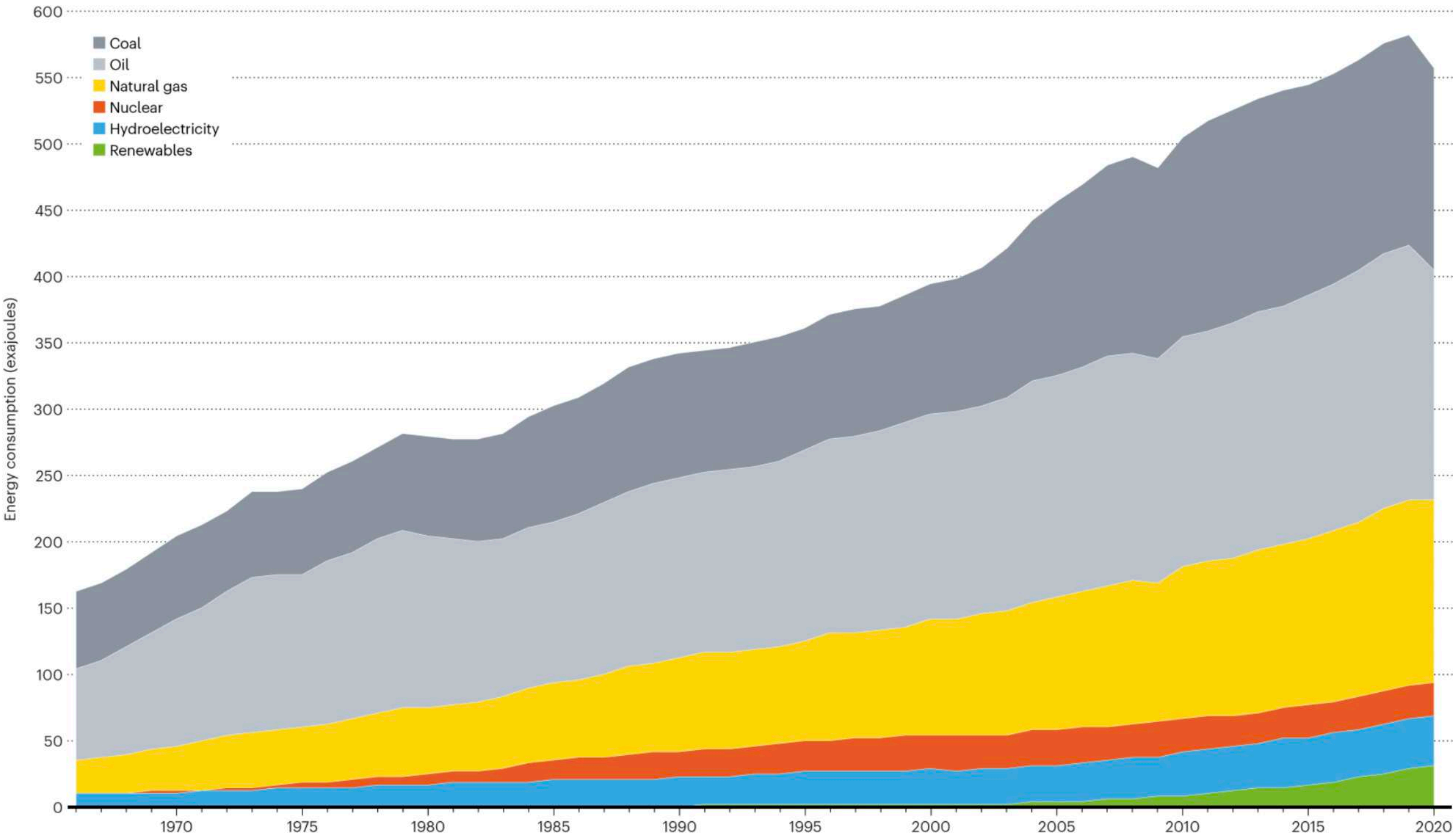

2005-Policies scenario
Current policy scenario
Unconditional NDC scenario
Conditional NDC scenario
2°C range
1.8°C range
1.5°C range
Turquoise area shows pathways limiting global temperature increase to below 2°C with about 66% chance
Green area shows pathways limiting global temperature increase to below 1.5°C by 2100 and peak below 1.7°C (both with 66% chance)
12 $GtCO_2e$
15 $GtCO_2e$
Cond. NDC case
Uncond. NDC case
Remaining gap to stay within 2°C limit
Median estimate of level consistent with 2°C: 41 $GtCO_2e$ (range 39-46)
29 $GtCO_2e$
32 $GtCO_2e$
Cond. NDC case
Uncond. NDC case
Remaining gap to stay within 1.5°C limit
Median estimate of level consistent with 1.5°C: 25 $GtCO_2e$ (range 22-31)
60
50
40
30
20
2015
2020
2025
2030
70
60
50
40
30
20
10
0
2010
2020
2030
2040
2050
2005-Policies scenario
Current policy scenario
Unconditional NDC scenario
Conditional NDC scenario
2°C range
1.8°C range
1.5°C range

UNEP (2019)

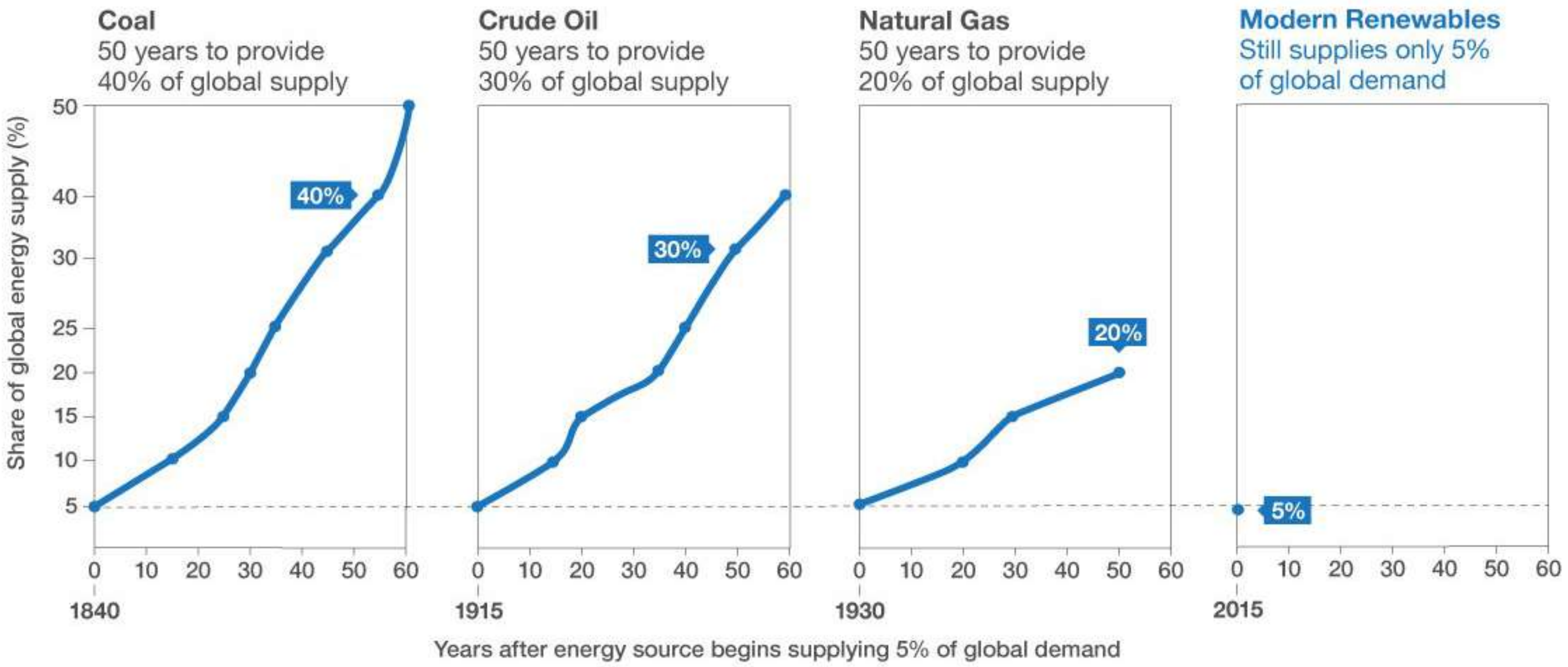

SCIENTIFIC EVIDENCE
Are scientists convinced?
YES 97% of climate scientists think global warming is significantly due to human activity
NO 3% of climate scientists do not think global warming is significantly due to human activity
There's a consensus of scientists because there's a consensus of evidence
MEDIA COVERAGE
Does reporting reflect the consensus?
YES 28% of news coverage depicts human contribution to warming as significant
NO 72% of news coverage includes a skeptic viewpoint or denies man-made warming
Media coverage misrepresents scientific understanding of man-made global warming
PUBLIC PERCEPTION
Are the public convinced?
YES 26% of people believe global warming is happening and humans are causing it
NO 74% of people are not convinced or deny humans are causing global warming
Media coverage of global warming is not 'balanced' and is affecting public opinion throughout the world



2025
No new sales of fossil fuel boilers
2021
No new unabated coal plants approved for development
2030
Universal energy access
All new buildings are zero-carbon-ready
60% of global car sales are electric
Most new clean technologies in heavy industry demonstrated at scale
1 020 GW annual solar and wind additions
Phase-out of unabated coal in advanced economies
2035
Most applicances and cooling systems sold are best in class
50% of heavy truck sales are electric
No new ICE car sales
All industrial electric motor sales are best in class
Overall net-zero emissions electricity in advanced economies
2040
50% of existing buildings retrofitted to zero-carbon-ready levels
50% of fuels used in aviation are low-emissions
Around 90% of existing capacity in heavy industries reach end of investment cycle
Net-zero emissions electricity globally
Phase-out of all unabated coal and oil power plants
2050
More than 85% of buildings are zero-carbon-ready
More than 90% of heavy industrial production is low-emissions
Almost 70% of electricity generation globally from solar PV and wind
2045
50% of heating demand met by heat pumps
Gt CO_2
40
35
30
25
20
15
10
5
0
-5
2020
2025
2030
2035
2040
2045
2050
No new oil and gas fields approved for development; no new coal mines or mine extensions
150 Mt low-carbon hydrogen 850 GW electrolysers
4 Gt CO_2 captured
435 Mt low-carbon hydrogen 3 000 GW electrolysers
7.6 Gt CO_2 captured
Electricity and heat
Industry
Transport
Buildings
Other

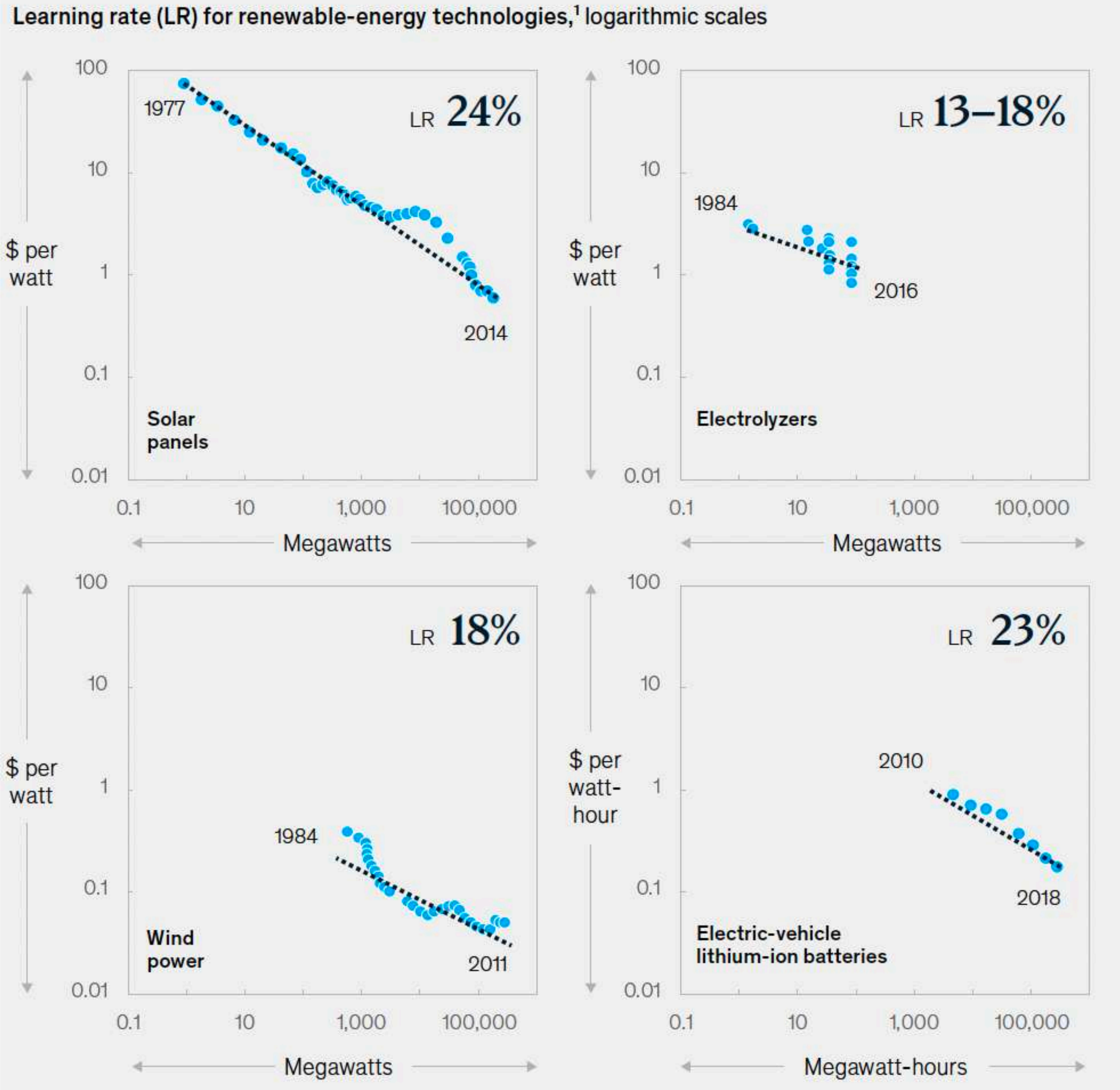


BP Statistical Review of World Energy, 2021



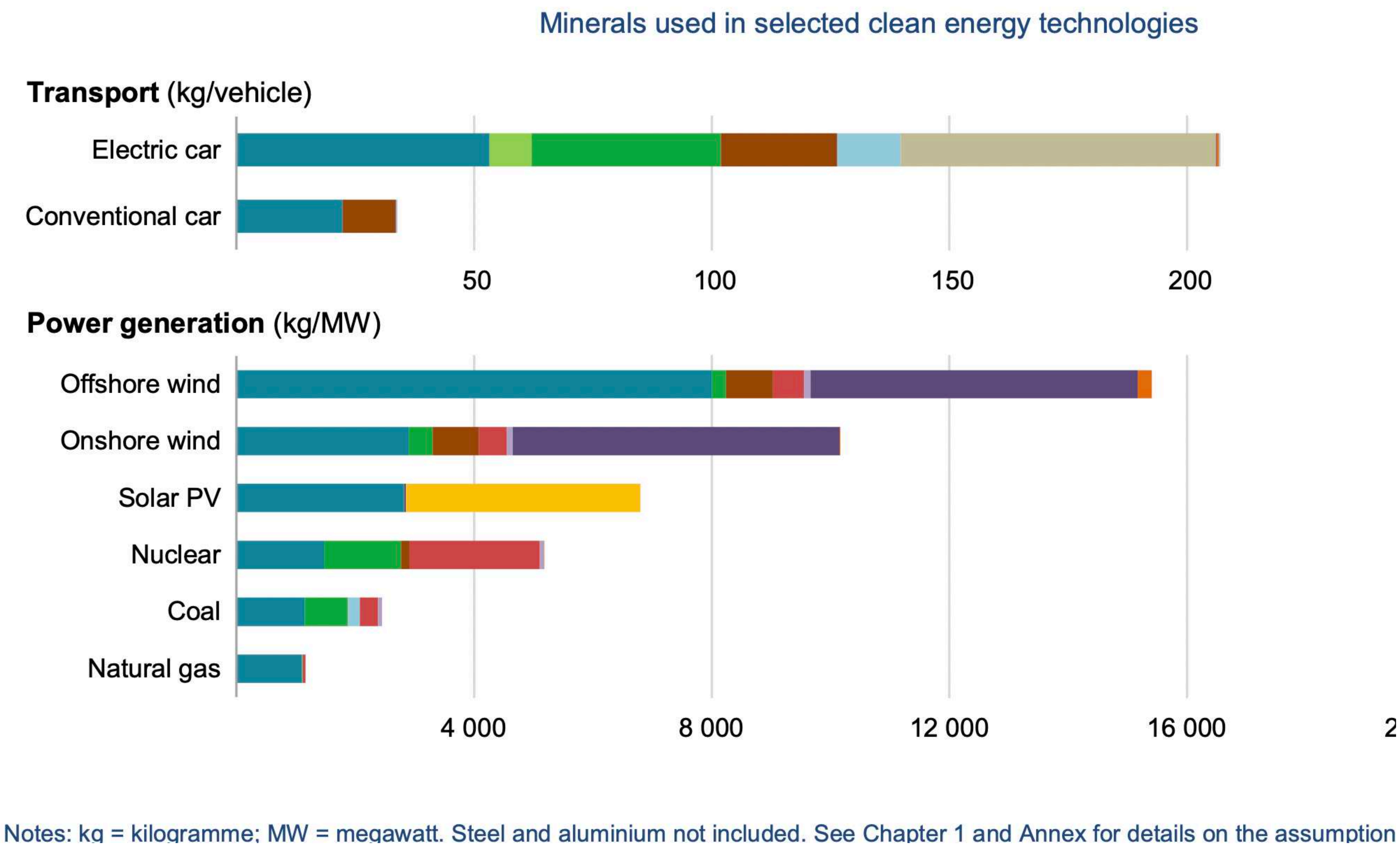
Vaclav Smil, 2010. Transiciones energéticas.

Los costes unitarios de algunas energías renovables han caído más de un 10% al año, a medida que escalaba la producción.



[1]The learning rate measures the fractional reduction in cost that occurs with a doubling of cumulative installed capacity. Costs include manufacturing costs only.
Source: Avicenne; Benchmark Mineral Intelligence; BloombergNEF; Gunther Glenk et al., "Economics of converting renewable power to hydrogen," *Nature Energy*, 2019, Vol 4, pp. 216–22, nature.com; Goksin Kavlak et al., "Evaluating the causes of cost reduction in photovoltaic modules," *Energy Policy*, 2018, Vol 123, pp. 700–10, journals.elsevier.com; International Energy Agency, *World Energy Outlook 2019*; US Energy Administration; McKinsey Center for Future Mobility

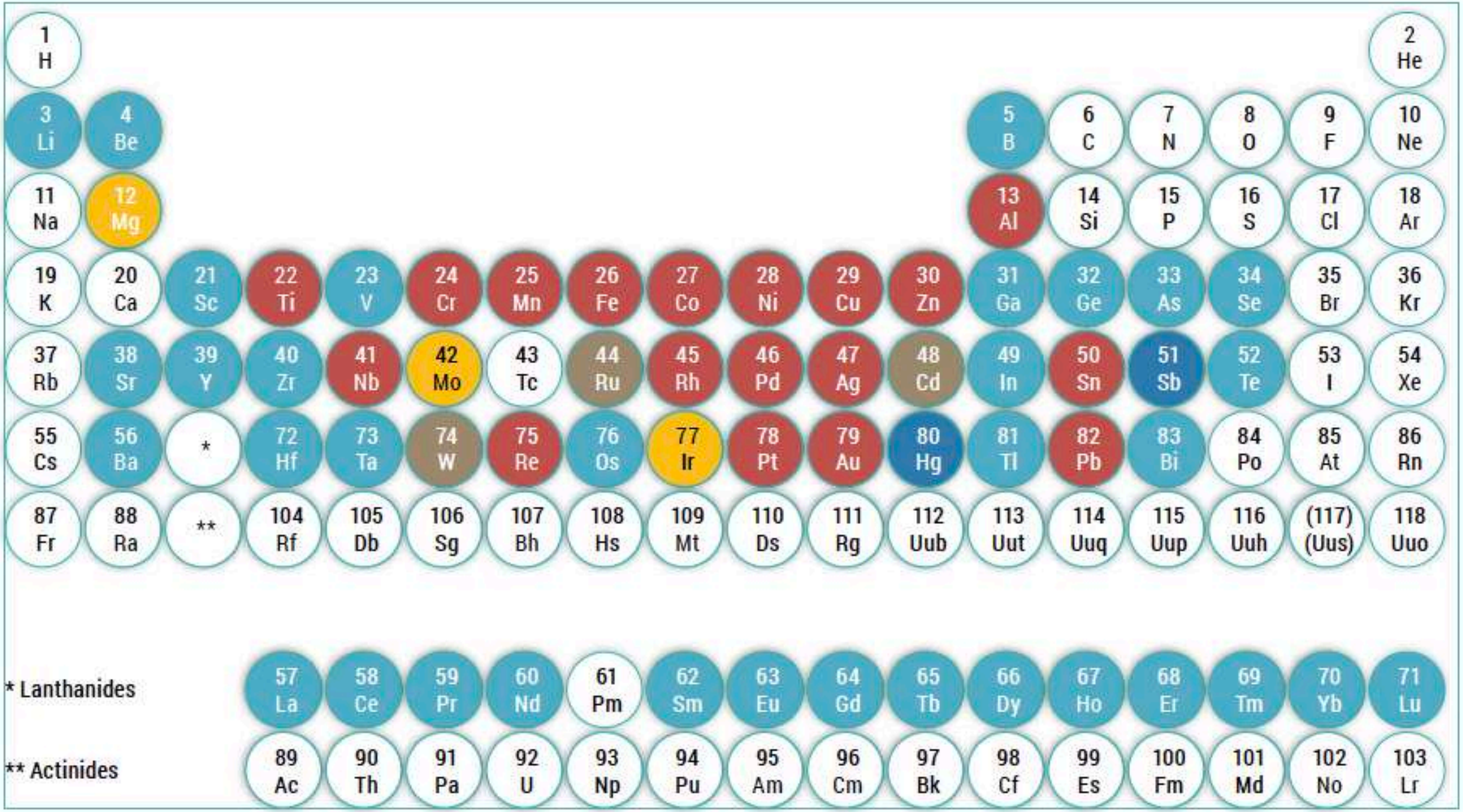
El rápido desarrollo de tecnologías energéticas más limpias como parte de la transición energética, aumenta la demanda de minerales



Less exposed — More exposed

Value chain		Overall shock exposure	Rank of exposure (1 = most exposed)					
			Pan-demic[1]	Large-scale cyber-attack[2]	Geo-physical event[3]	Heat stress[4]	Flood-ing[5]	Trade dispute[6]
Global innovations	Chemical	11	16	4	6	19	16	8
	Pharmaceutical	19	23	2	17	23	19	4
	Aerospace	8	2	1	18	20	21	5
	Automotive	14	6	9	12	21	18	6
	Transportation equipment	4	5	12	7	13	5	15
	Electrical equipment	16	17	11	9	15	15	10
	Machinery and equipment	18	9	10	20	17	20	7
	Computers and electronics	6	15	5	4	14	14	9
	Communication equipment	1	13	3	2	16	7	2
	Semiconductors and components	9	19	6	1	18	23	1
	Medical devices	23	22	8	22	22	22	3

Exposure to globally affected value chain shocks based on their geographic footprint and factors of production. McKinsey Global Institute Analysis, 2021

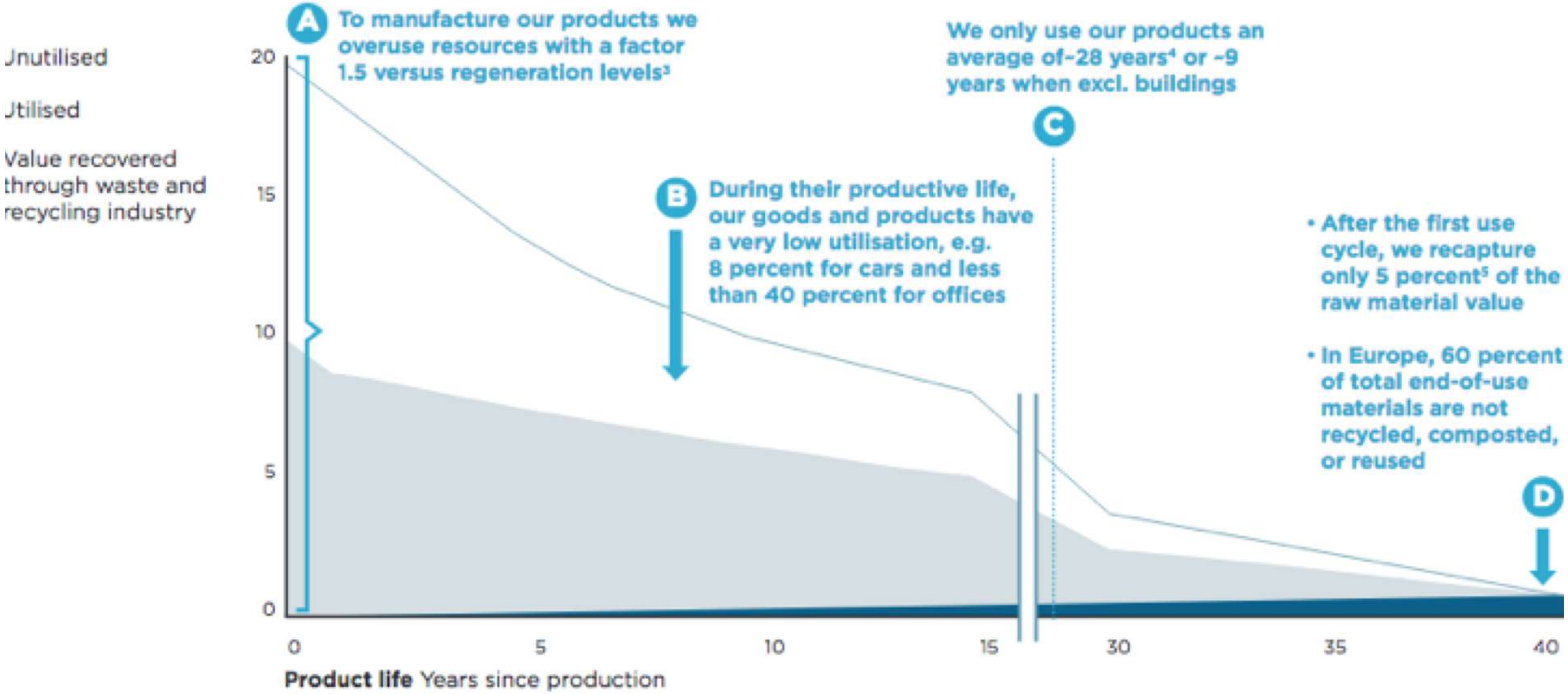


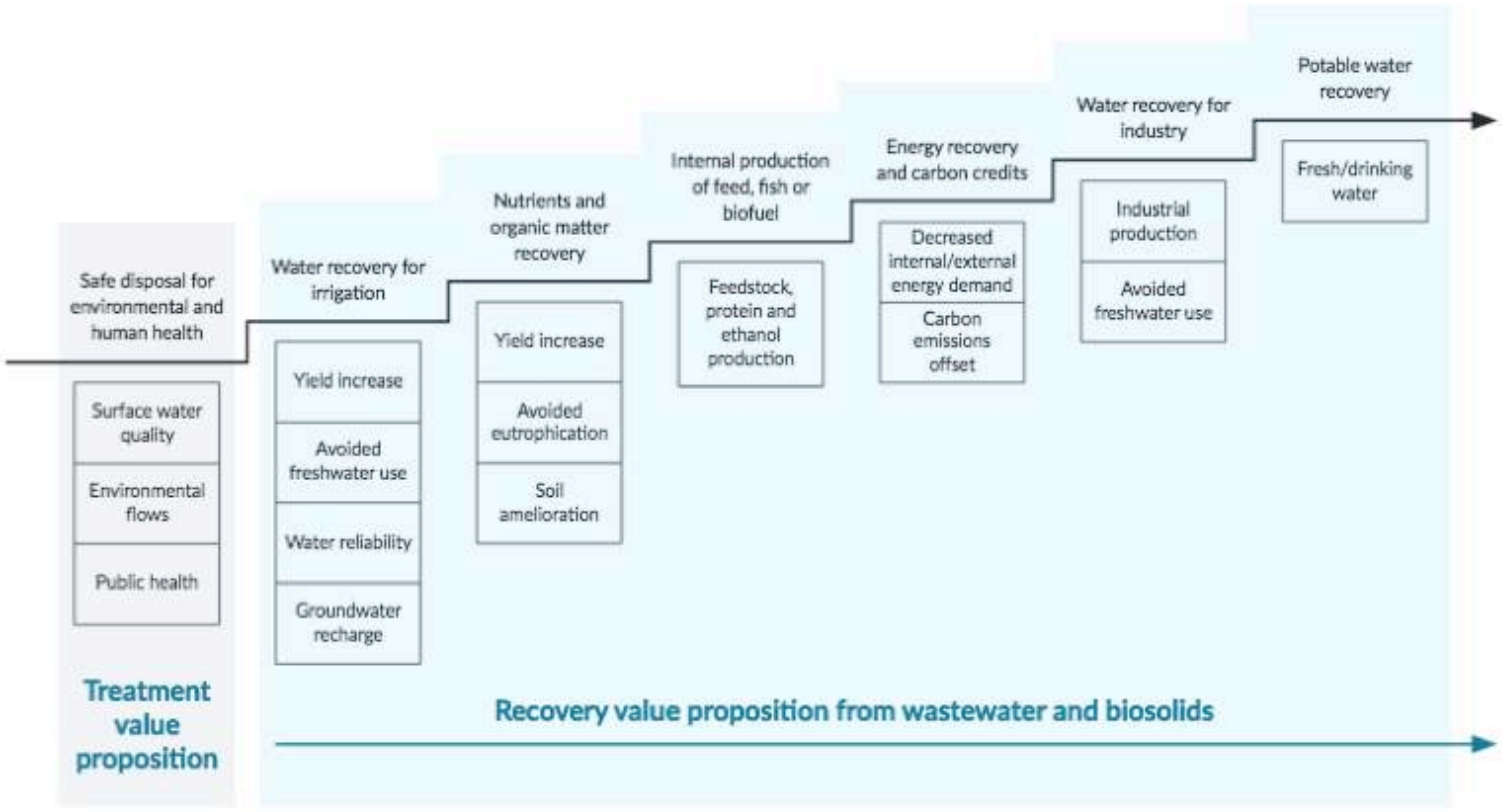
<1% 1-10% >10-25% >25-50% >50%

Fraction of potentially available material in end-of-life products that is actually recycled.

Economía circular – escala y simbiosis industrial

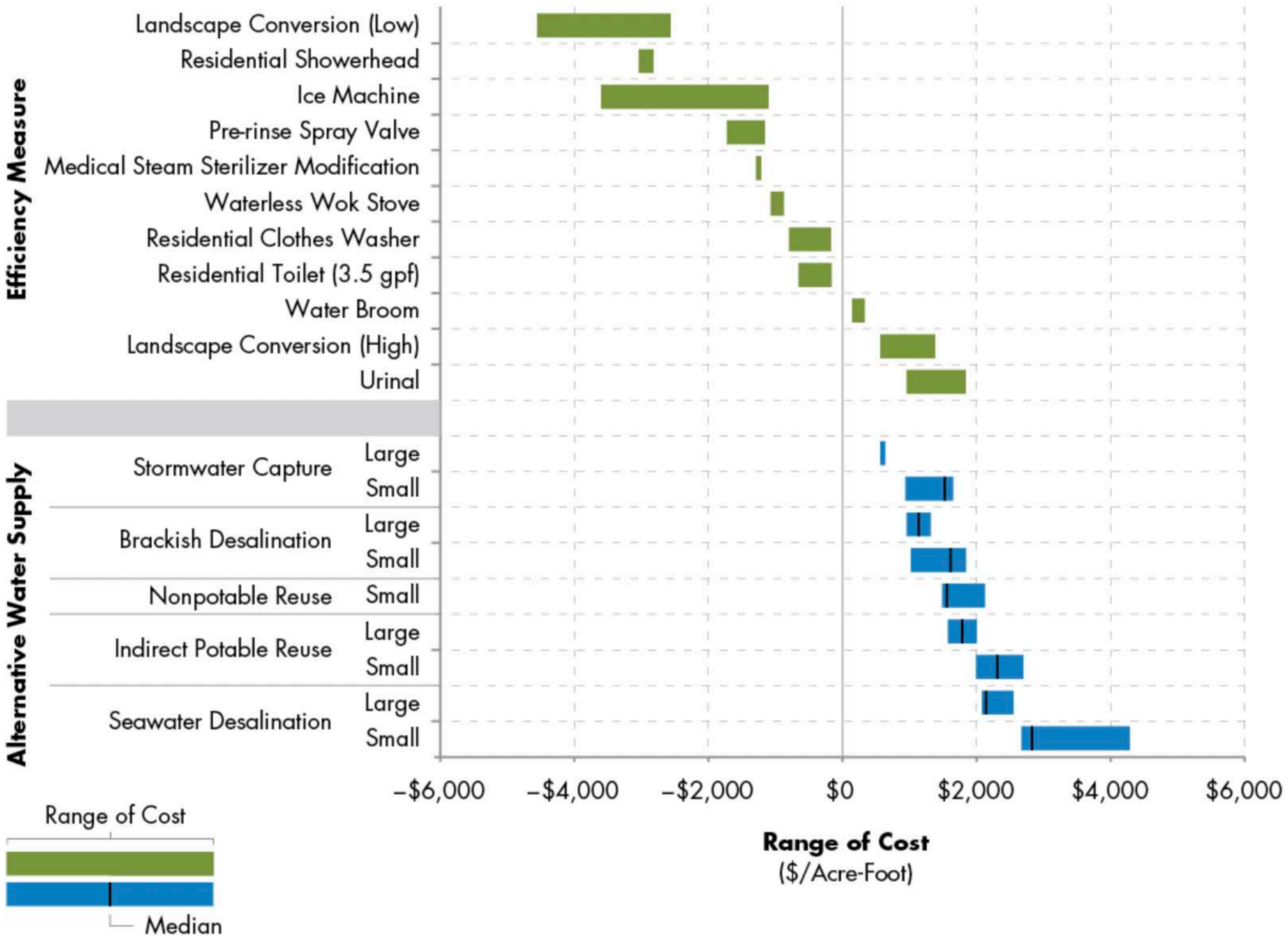
Cronología que representa el desarrollo de la recuperación de recursos de salmuera y agua de mar. Li, X., Mo, Y., Qing, W., Shao, S., Tang, C. Y., & Li, J. (2019). Membrane-based technologies for lithium recovery from water lithium resources: A review. Journal of Membrane Science, 591, 117317


Unutilised
Utilised
Value recovered through waste and recycling industry
A To manufacture our products we overuse resources with a factor 1.5 versus regeneration levels[3]
B During their productive life, our goods and products have a very low utilisation, e.g. 8 percent for cars and less than 40 percent for offices
C We only use our products an average of ~28 years[4] or ~9 years when excl. buildings
• After the first use cycle, we recapture only 5 percent[5] of the raw material value
• In Europe, 60 percent of total end-of-use materials are not recycled, composted, or reused
D
20
15
10
5
0
0
5
10
15
30
35
40
Product life Years since production

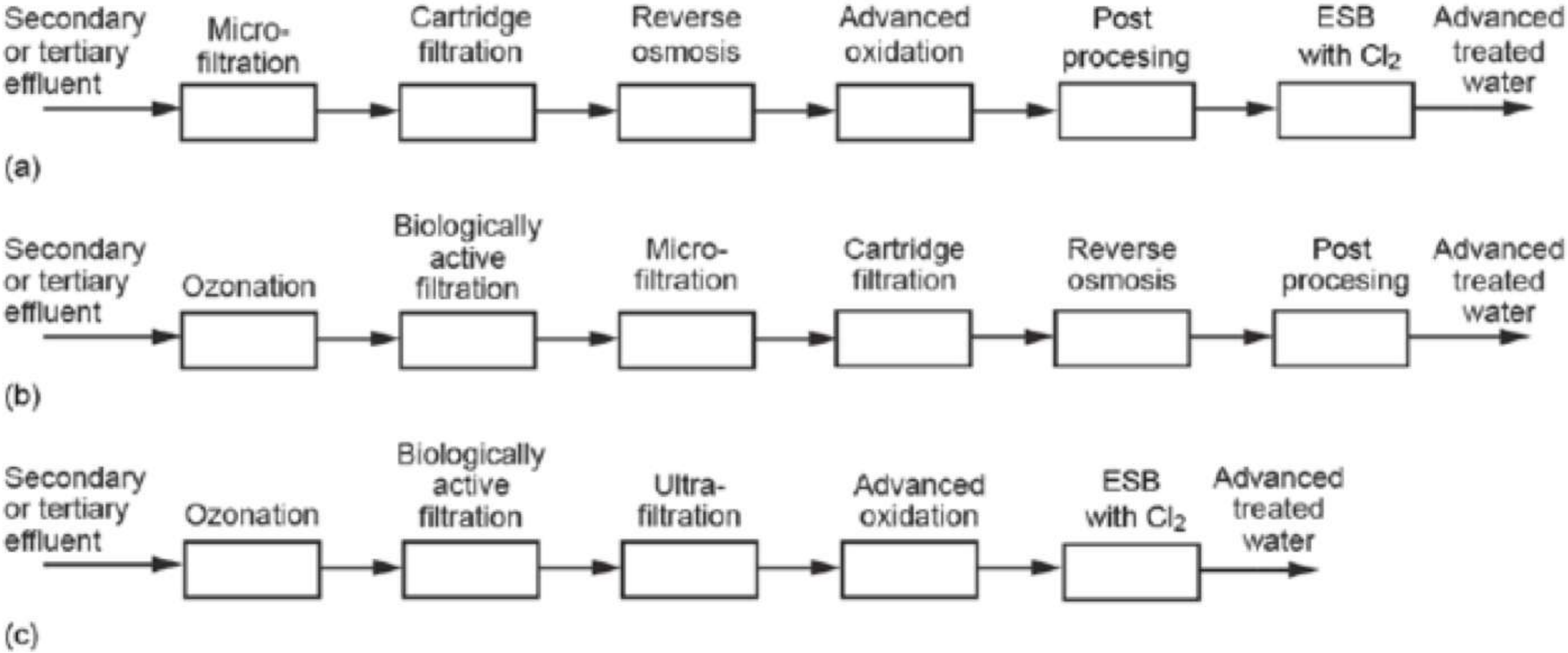


Dreschel et al., 2015

Levelized Cost of Alternative Water Supply and Water Conservation and Efficiency Measures, in 2015 dollars per acre-foot



Pacific Institute

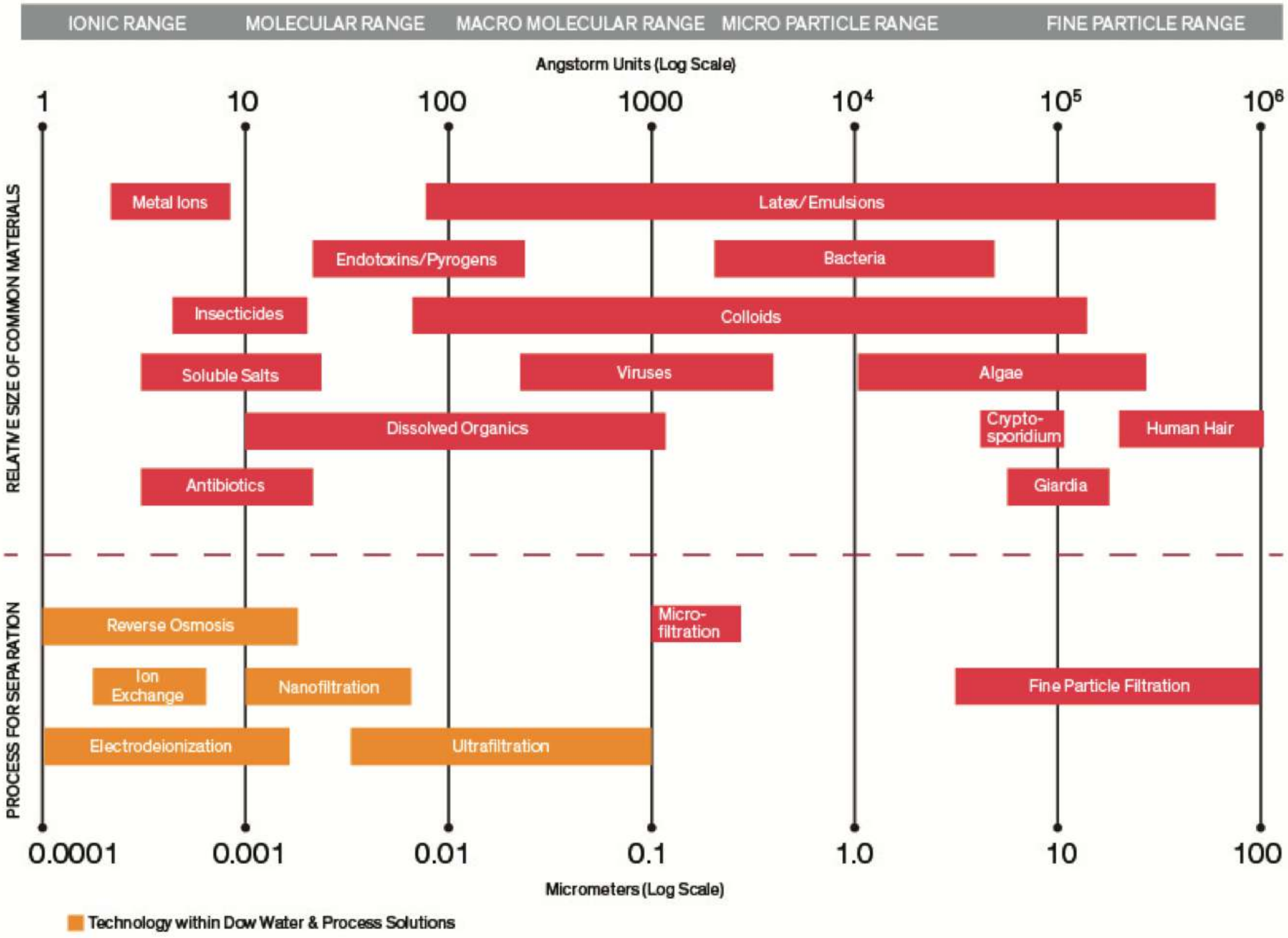


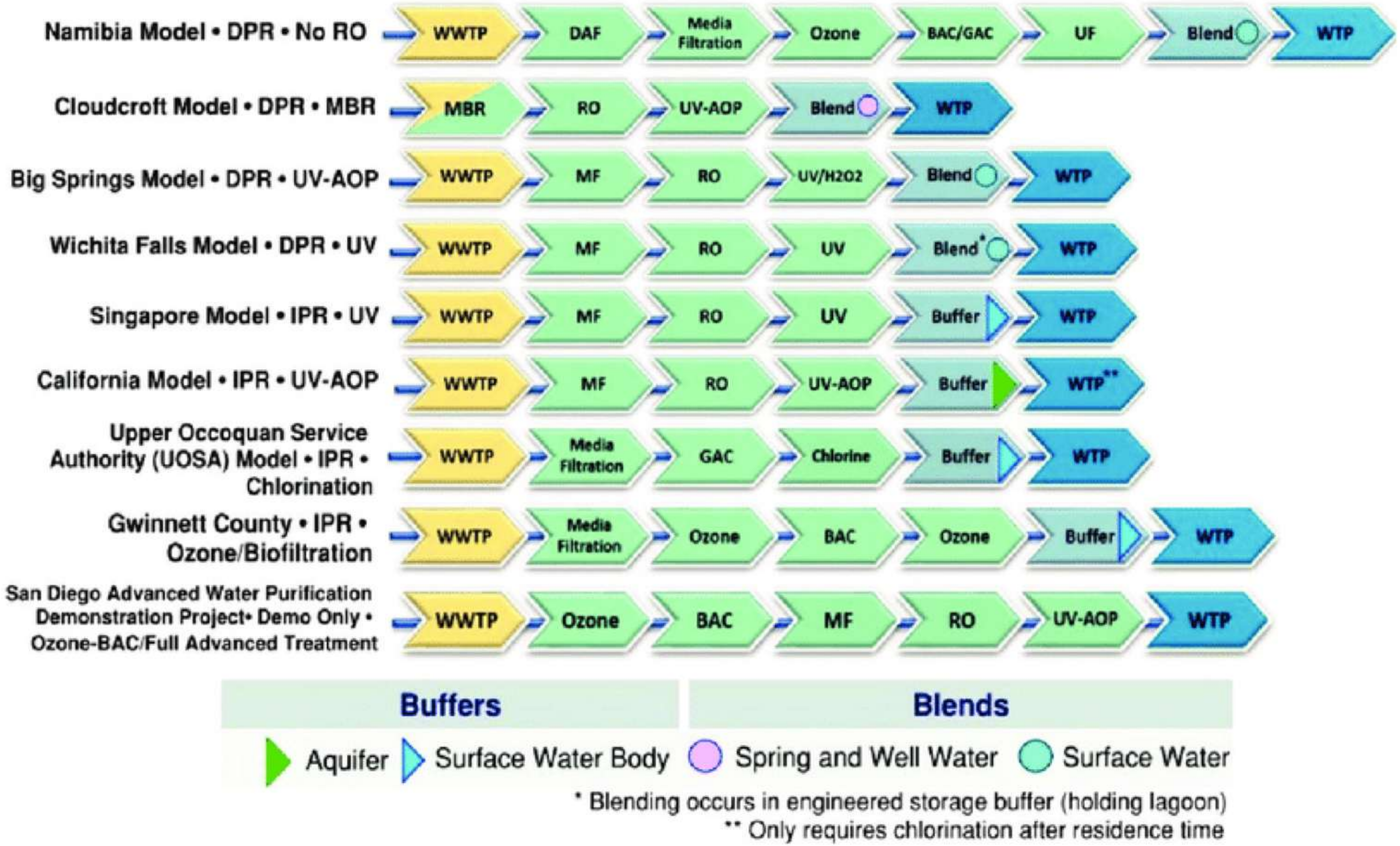
Tres tratamientos de agua avanzados típicos (AWT) trains (Tchobanoglo us, 2014)

Constituent	Unit	Untreated Wastewater	Range of Effluent Quality after Indicated Treatment			
			Conventional Activated Sludge with Filtration	Activated Sludge with O_3/BAF	Activated Sludge with MF and RO	Activated Sludge with MF, RO, and UV-AOP
Total suspended solids	mg/L	130–389	2–8	1–2	≤1	≤1
Turbidity	NTU	80–150	1–10	≤1	≤0.1	≤0.1
Biochemical oxygen demand	mg/L	133–400	<5–20	≤1	≤1	≤1
Chemical oxygen demand	mg/L	339–1016	30–70	≤10–30	≤2–10	≤2–10
Total organic carbon	mg/L	109–328	15–30	2–5	0.1–1	0.1–1
Ammonia nitrogen	mg N/L	14–41	1–6	≤1	≤1	≤1
Nitrate nitrogen	mg N/L	0–trace	5–30	5–30	≤1	≤1
Nitrite nitrogen	mg N/L	0–trace	0–trace	≤0.001	≤0.001	≤0.001
Total nitrogen	mg N/L	23–69	15–35	≤1	≤1	≤1
Total phosphorus	mg P/L	3.7–11	2–6	2–6	≤0.5	≤0.5
Volatile organic compounds	μg/L	<100–>400	10–40	≤1	≤1	≤1
Iron and manganese	mg/L	1–2.5	1–1.4	≤0.3	≤0.1	≤0.1
Surfactants	mg/L	4–10	0.5–1.5	≤0.5	≤0.1	≤0.1
Totals dissolved solids	mg/L	374–1121	374–1121	374–1121	≤5–40	≤5–40
Chemical constituents[a]	μg/L	10–50	5–30	≤0.1	≤0.1	≤0.1
Total coliform	No./100 mL	10^6–10^{10}	10^3–10^5	350	<1	<1
Protozoan cysts and oocysts	No./100 mL	10^1–10^5	0–10	≤0.002	≤0.002	≤0.002
Viruses	PFU/100 mL	10^1–10^8	10^1–10^4	≤0.03	≤0.03	≤0.03

Notes: [a]For example, fire retardants, personal care products, and prescription and nonprescription drugs; AOP=advanced oxidation process; BAF=biologically active filtration; MF=microfiltration; O_3=ozone; PFU=plaque-forming units; RO=reverse osmosis; UV=ultraviolet.

Tchobanoglous et al. 2014


IONIC RANGE
MOLECULAR RANGE
MACRO MOLECULAR RANGE
MICRO PARTICLE RANGE
FINE PARTICLE RANGE
Angstorm Units (Log Scale)
1
10
100
1000
10⁴
10⁵
10⁶
RELATIVE SIZE OF COMMON MATERIALS
Metal Ions
Latex/Emulsions
Endotoxins/Pyrogens
Bacteria
Insecticides
Colloids
Soluble Salts
Viruses
Algae
Dissolved Organics
Crypto-sporidium
Human Hair
Antibiotics
Giardia
PROCESS FOR SEPARATION
Reverse Osmosis
Micro-filtration
Ion Exchange
Nanofiltration
Fine Particle Filtration
Electrodeionization
Ultrafiltration
0.0001
0.001
0.01
0.1
1.0
10
100
Micrometers (Log Scale)
Technology within Dow Water & Process Solutions



Tricas et al. 2018

Intel® IoT Platform

Secure, Scalable, Interoperable

The Intel® IoT Platform includes an end-to-end reference architecture and a portfolio of products from Intel and its ecosystem, that work with third-party solutions, to provide a foundation for seamlessly and securely connecting devices, delivering trusted data to the cloud, and delivering value through analytics.

“La resistencia al agua reutilizada es en gran parte psicológica. Hay muchos ejemplos en los que los sentimientos o las intuiciones de las personas van en contra de su propio interés racional y, a veces, del interés general. Las estrategias para hacer frente a este desajuste necesitan mayor atención”