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# Reality cheques

Energy, natural risk  
and markets

MAY 2023

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“ Three things exercise a constant influence over the minds of men: climate, government and religion.

Voltaire, 1756

*Essai sur les moeurs et l'esprit des nations*









Source: Office for National Statistics, data to March 2023. Inflation rate for food and non-alcoholic beverages









World Meteorological Organization

@WMO



WMO Update: Prepare for #ElNiño 🌱

We just had the 8 warmest years on record despite cooling La Niña for 3 straight years.

An El Niño event will most likely lead to a new spike in global heating and increase the chance of breaking temperature records.

[bit.ly/3LP7yUr](https://bit.ly/3LP7yUr)

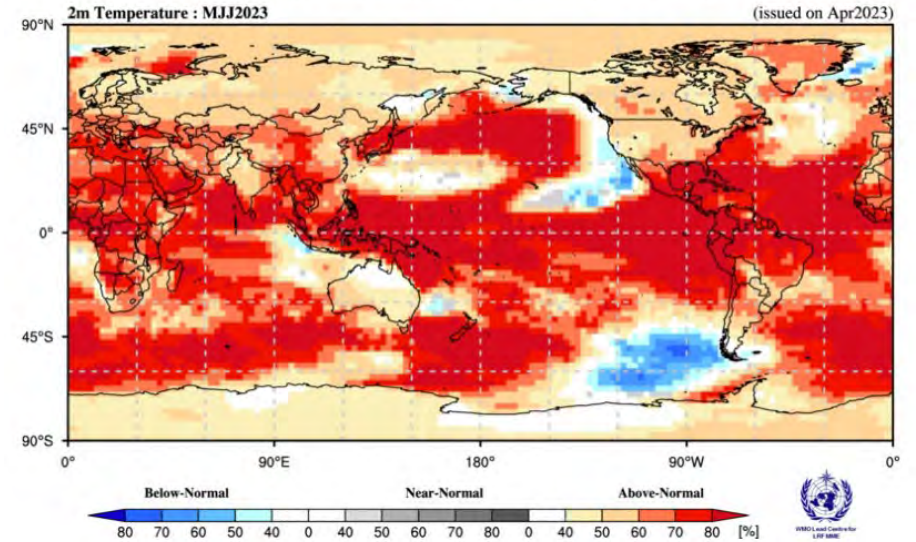


2:42 PM · May 3, 2023 · 156.1K Views

## Surface Air Temperature, MJJ 2023

Probabilistic Multi-Model Ensemble Forecast

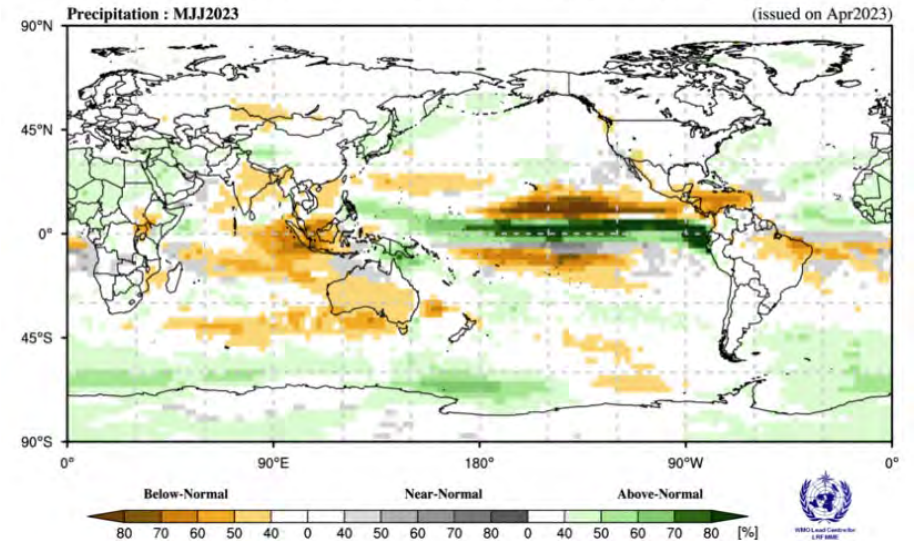
Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington



## Precipitation, MJJ 2023

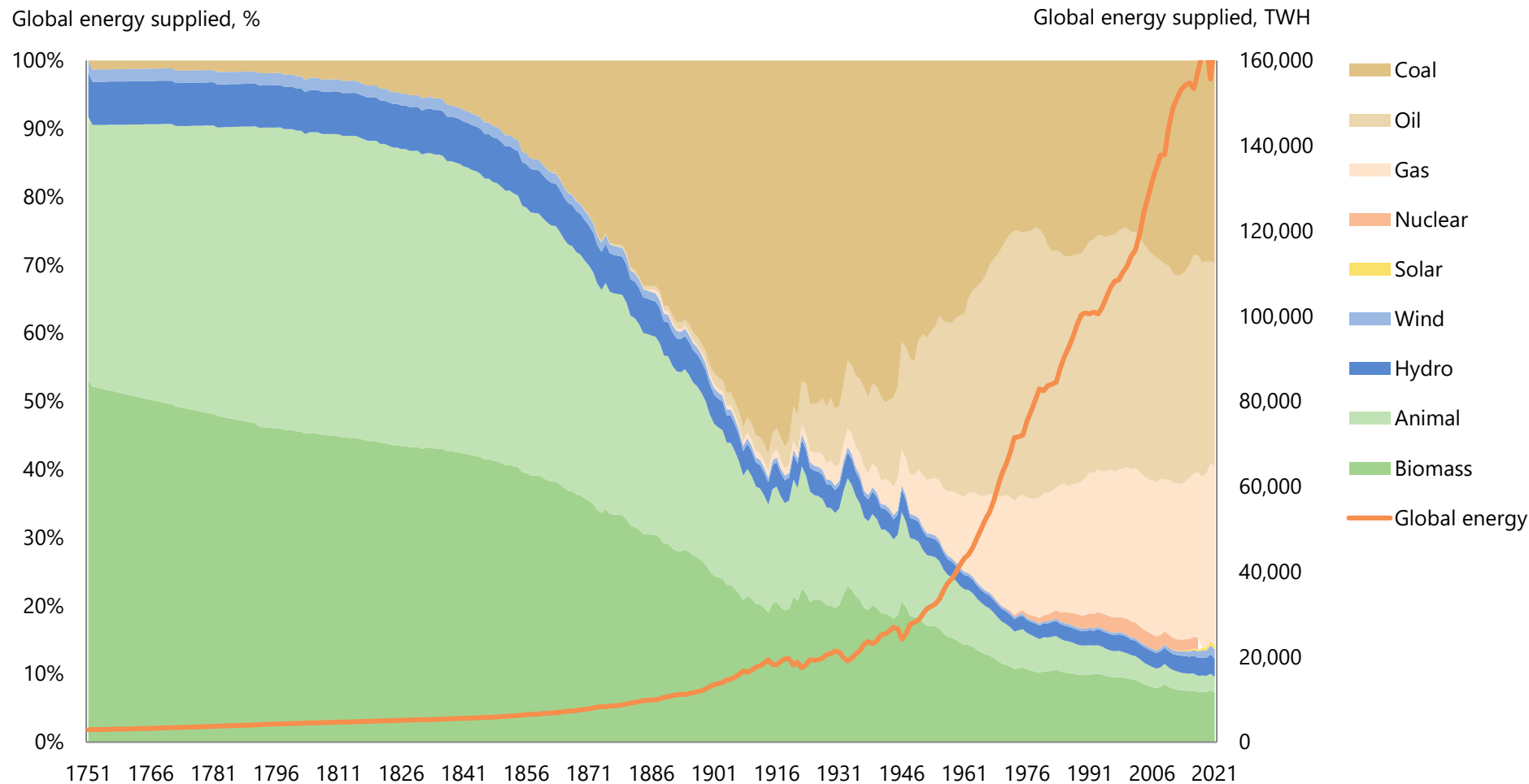
Probabilistic Multi-Model Ensemble Forecast

Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington





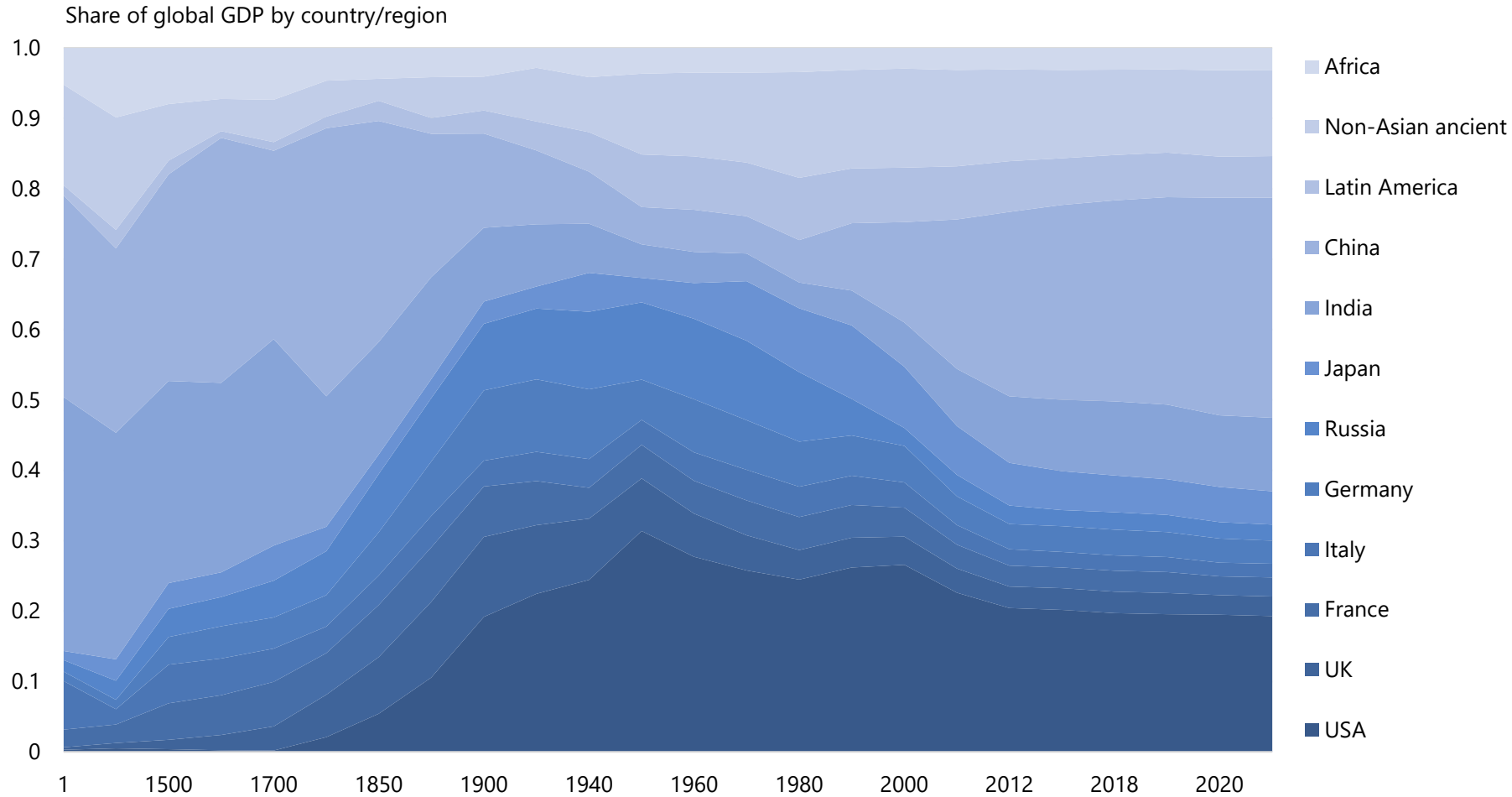
# Global energy supplied by source 1750-2021





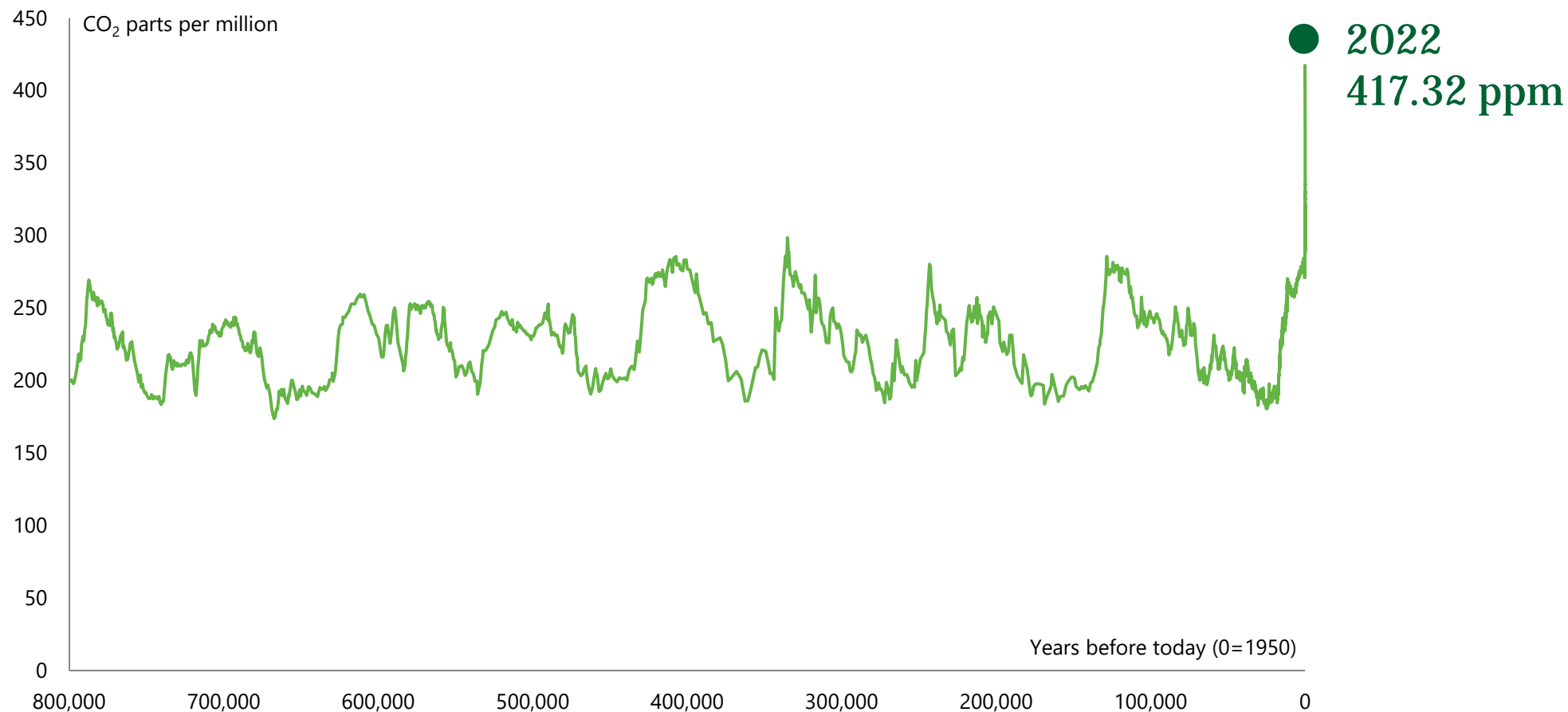
# Energy = Power

CHINA LOST THE LAST INDUSTRIAL REVOLUTION – IT INTENDS TO WIN THE DIGITAL AND CLEAN TECH ONE





# The long view: more hot air

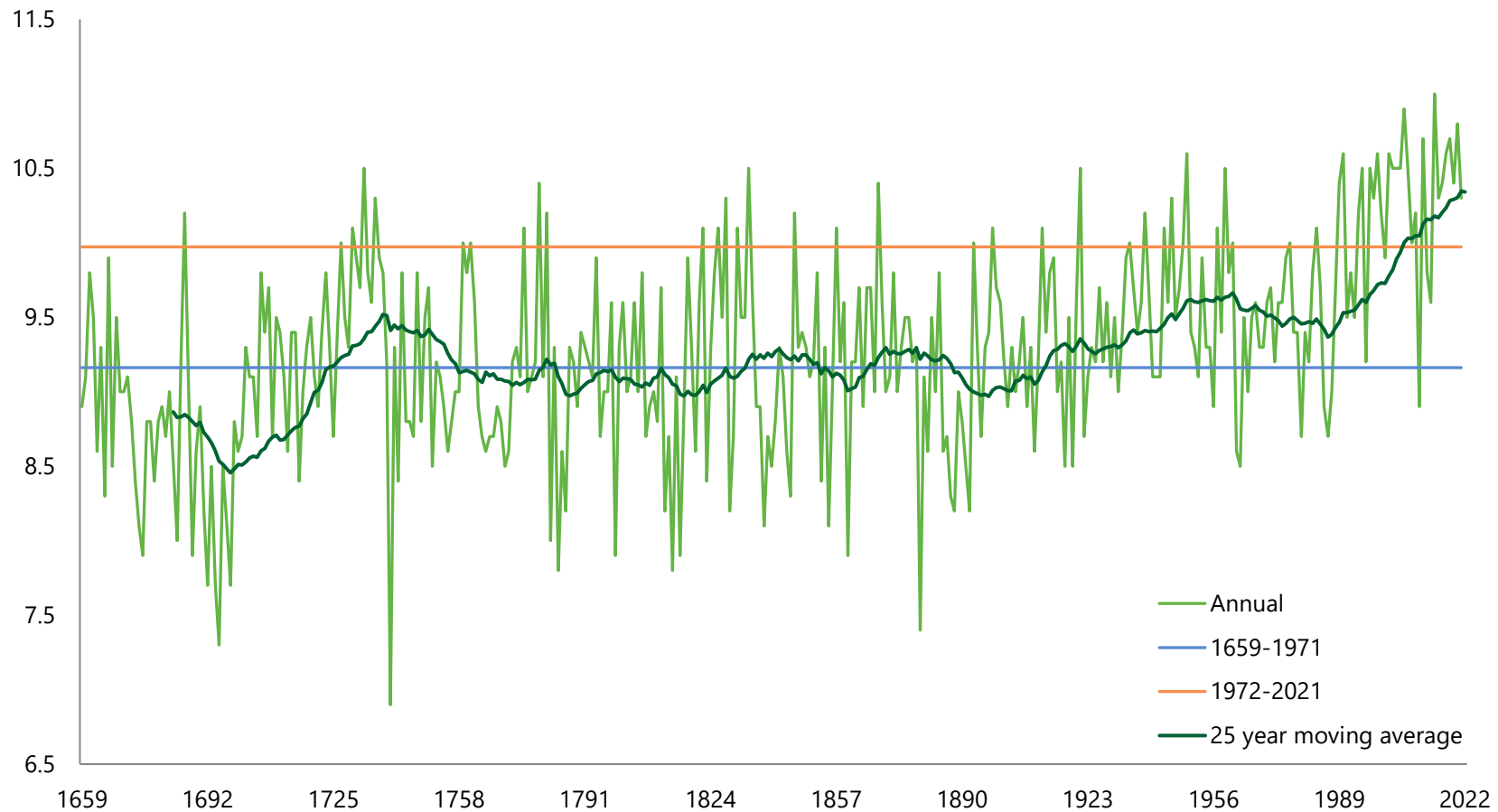


Source: Luthi et al 2008, Etheridge et al 2010. Vostok ice core data/JR Petit et al NOAA Mauna Loa CO<sub>2</sub> record. Some description adapted from the Scripps CO<sub>2</sub> Program Keeling Curve Lessons



# Sometimes the trend is not your friend...

UK ANNUAL AVERAGE TEMPERATURES, 1659-2021





**WANTED:**  
A new industrial revolution  
(to reverse the original!)





Natural disaster  
and Acts of God  
have preoccupied  
Man since the  
dawn of time

Noah's Ark: an early example  
of prudential planning and  
physical resilience







Apocalypse Now?

Humanity is  
hard-wired for  
the end of days

(So far, so good!)





Something to believe in  
ESG fits a basic  
human need

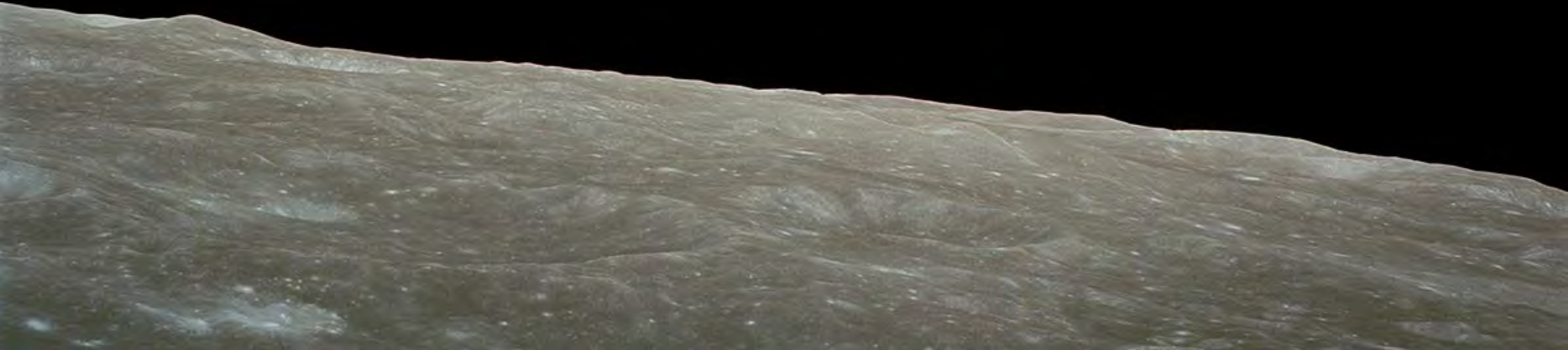




THE  
CLIMATE  
BOOK

EDITED BY  
GRETA THUNBERG

# Macro



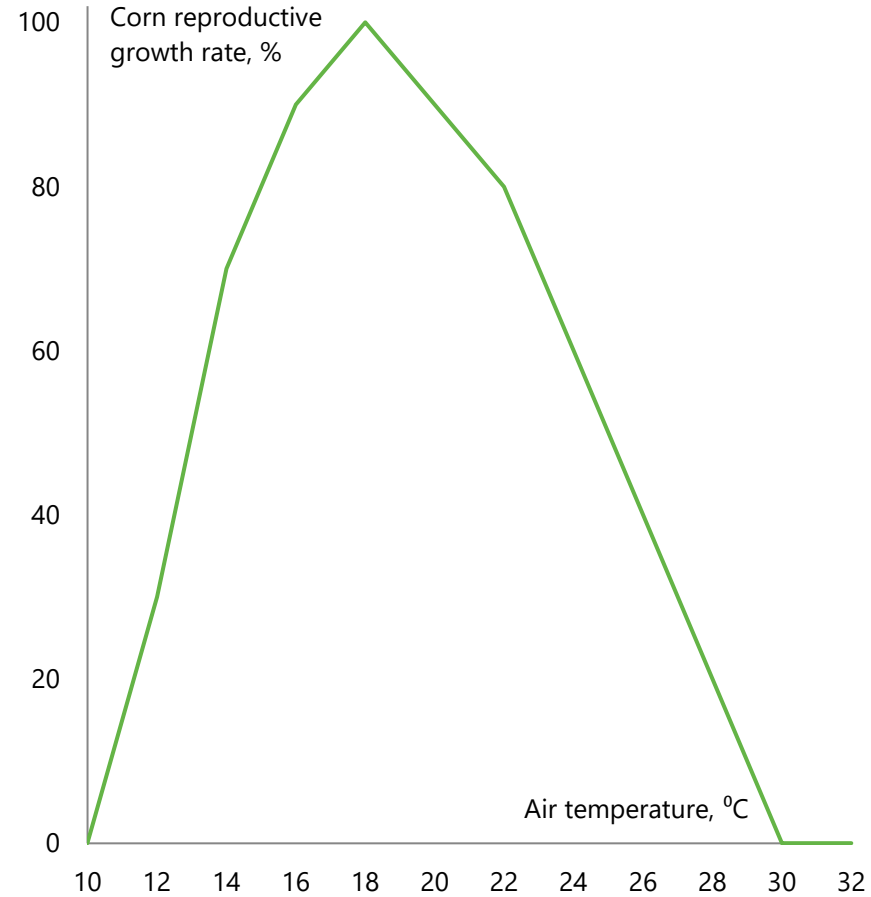
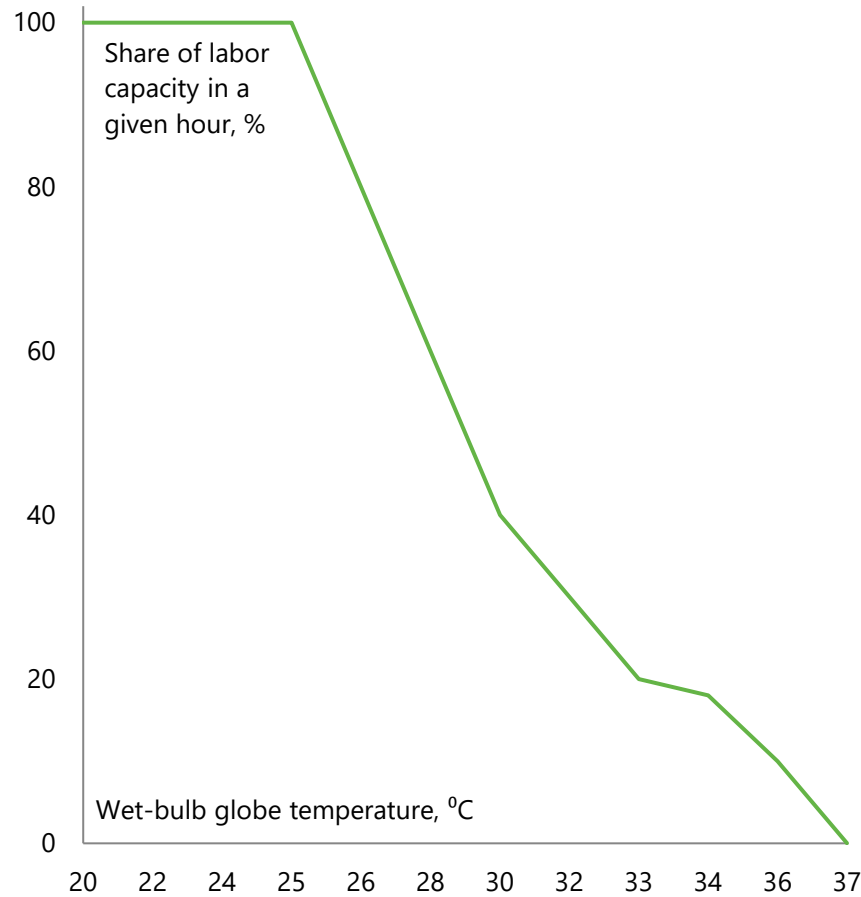






# Non-linearity in complex systems

MARKETS ARE COMPLEX, THE ENVIRONMENT FAR MORE SO

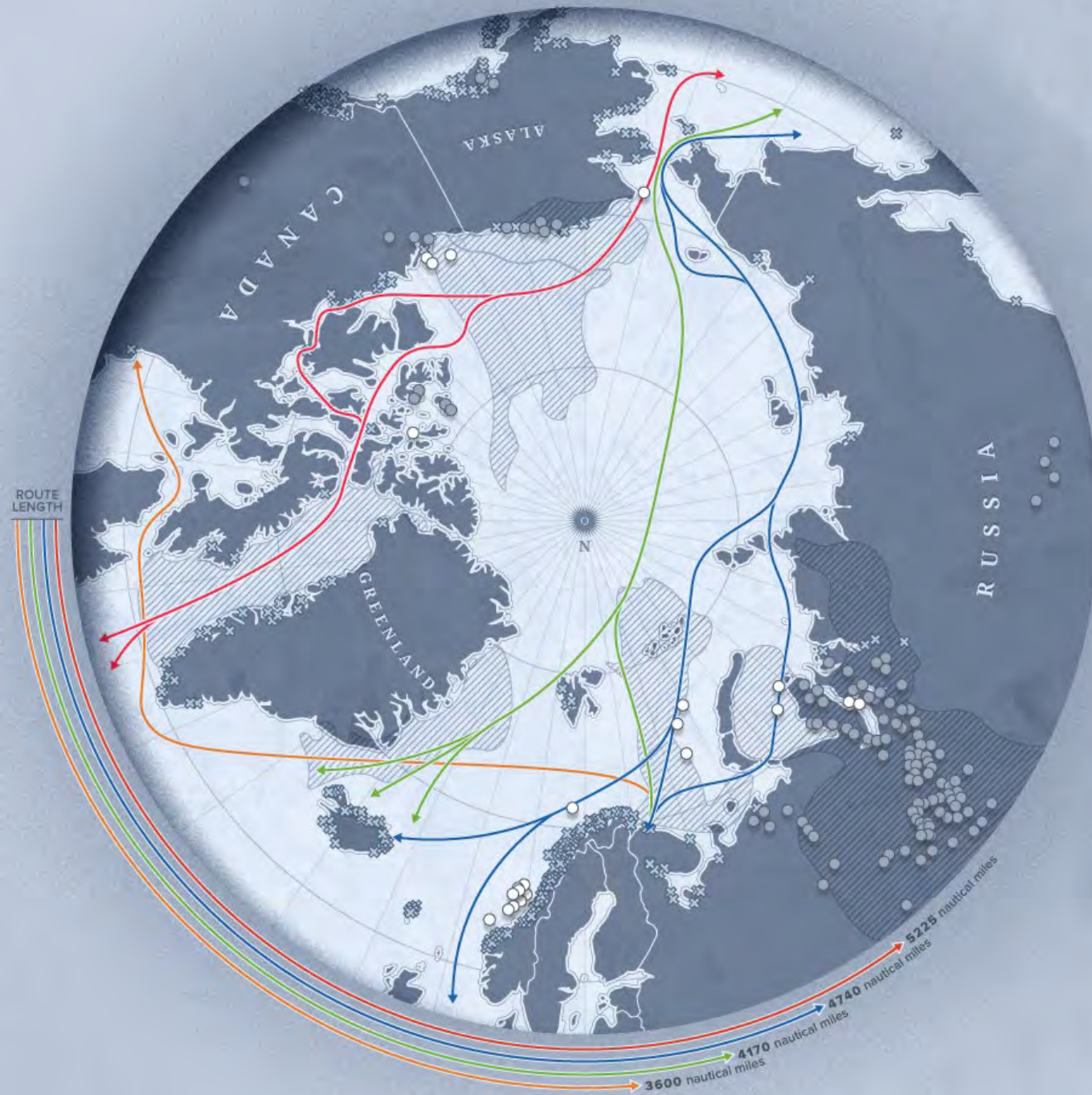


Source: McKinsey and Company., Dunne et al., 2013, adjusted according to Foster et al., 2018, Henneaux, 2015, Korres et al., 2016, CATDAT global database on historic flooding events, McKinsey infrastructure benchmark costs, EU Commission Joint Research Centre damage functions database, historical insurance data and expert engineer interviews on failure thresholds, McKinsey Global Institute analysis



# Polar silk roads

Climate is physically re-ordering political economy

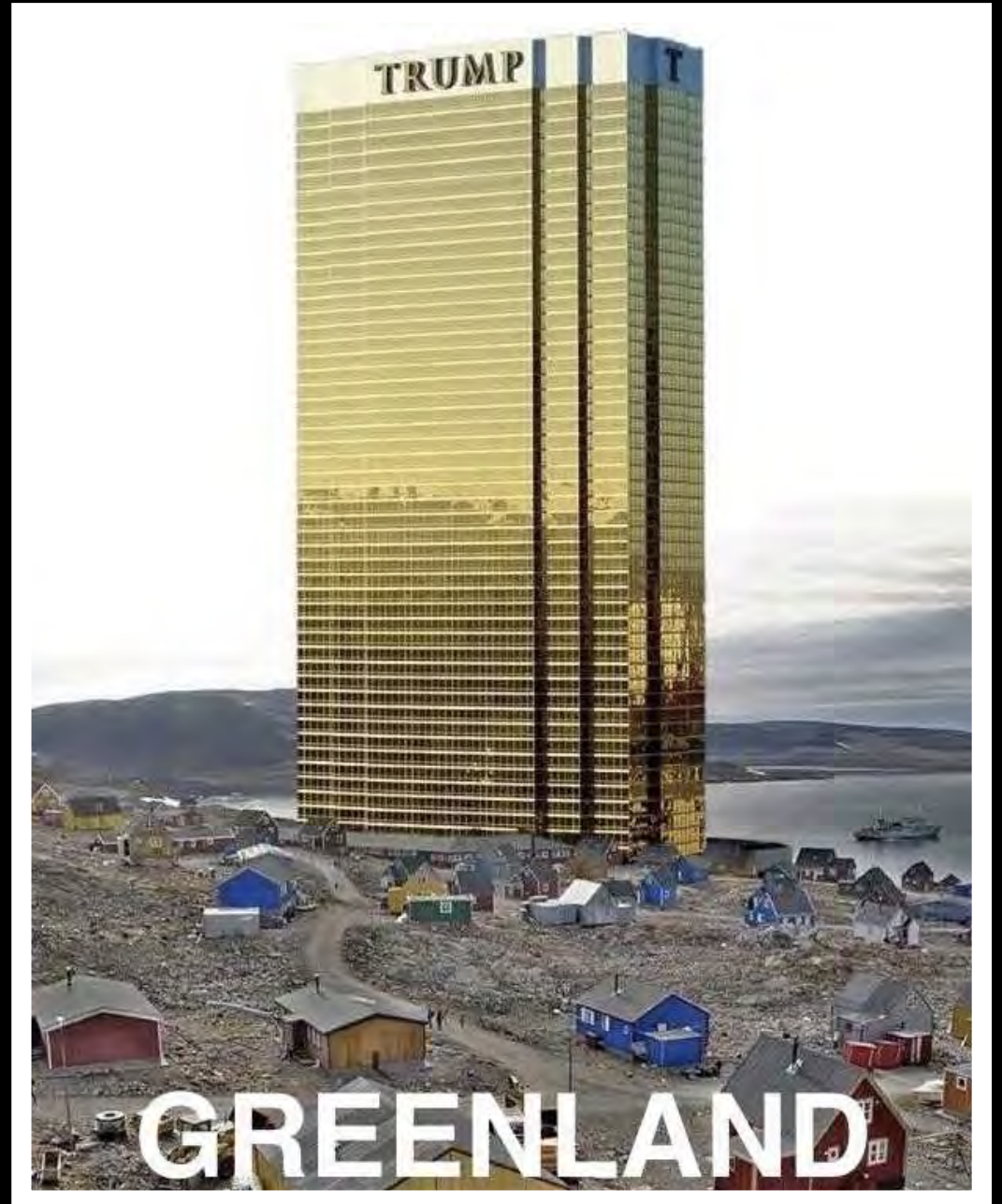


- Northwest passage
- Northeast passage
- Northern sea route
- Arctic bridge route



# From Green New Deal to... Green... land?

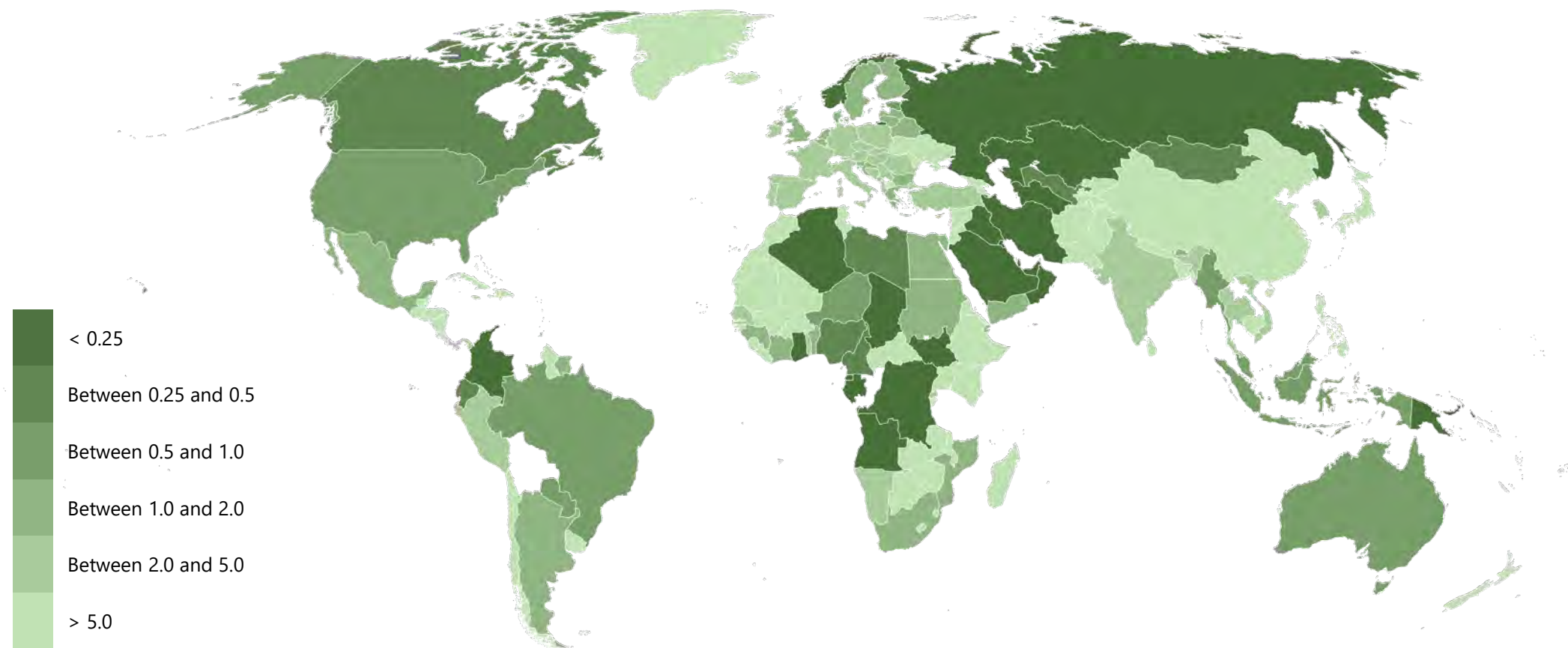
Climate is changing the strategic  
calculus, and Greenland is an  
invaluable asset





# From a hydrocarbon world order...

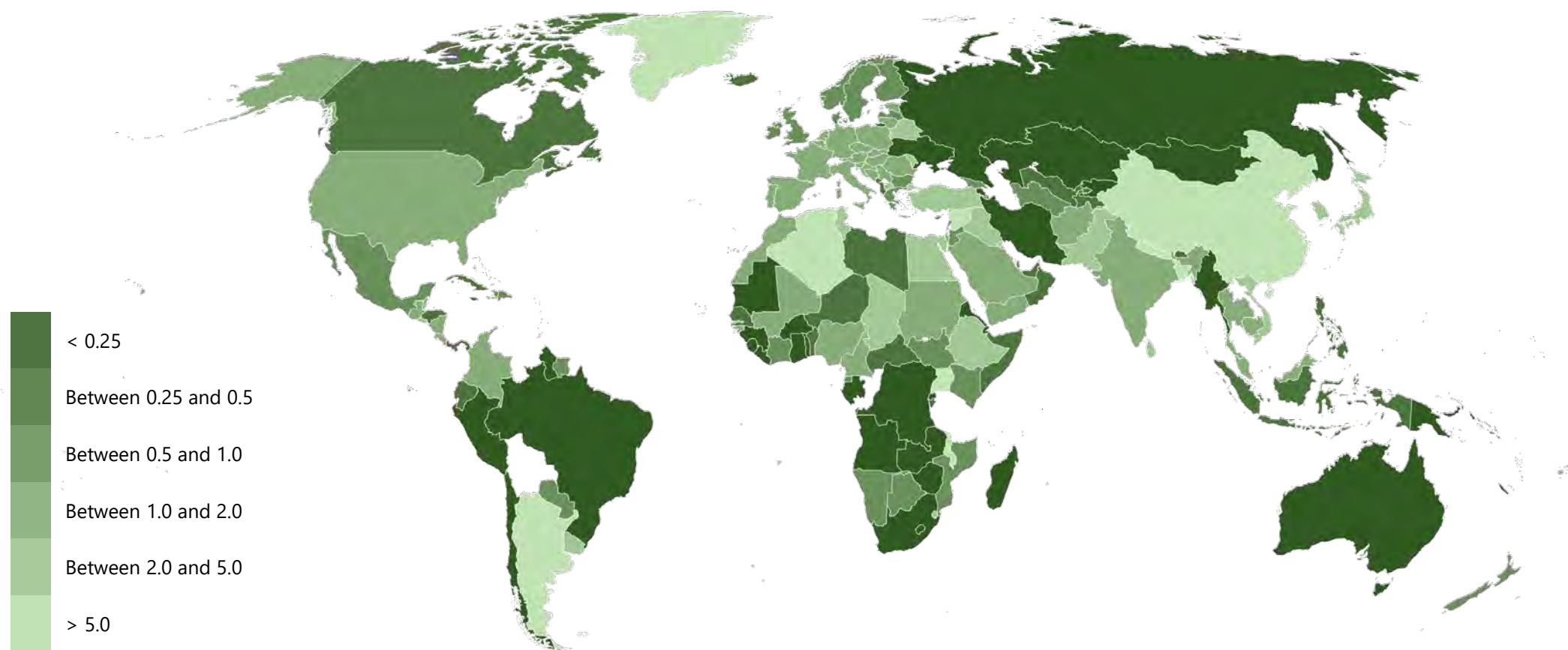
RATIO OF FUEL IMPORTS TO EXPORTS. EUROPE, CHINA AND JAPAN ARE ALL VULNERABLE TO HIGH FUEL PRICES





# ...to a metal world order

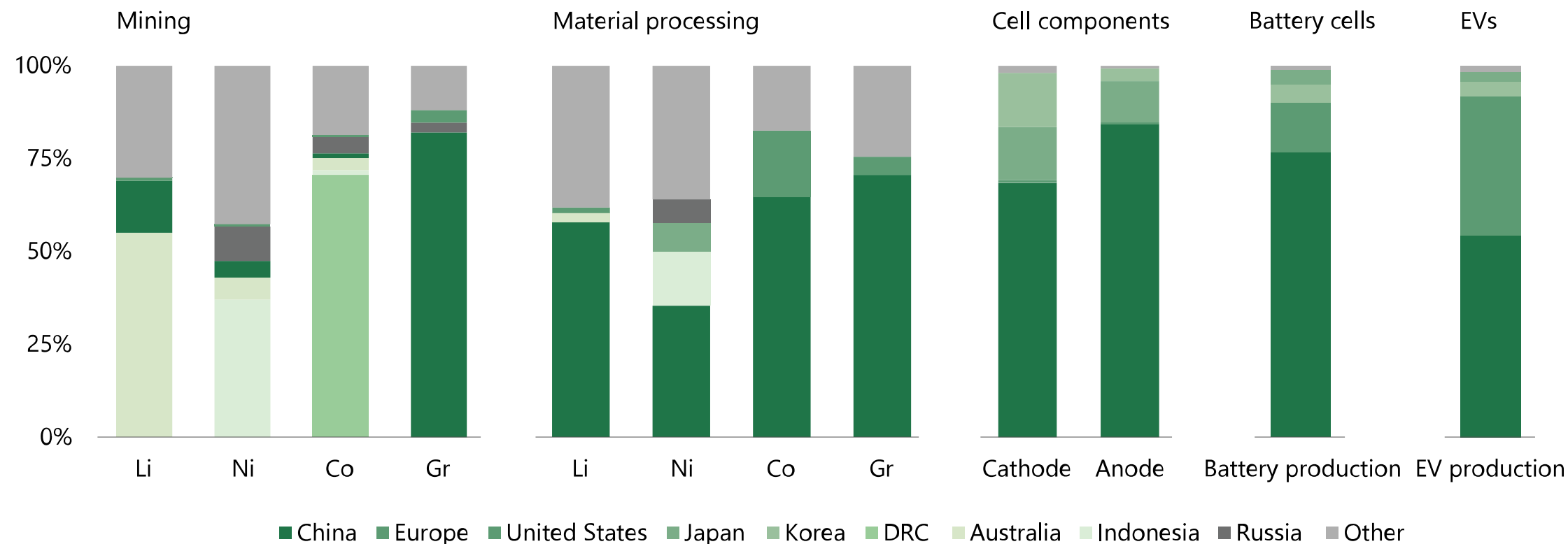
RATIO OF HARD COMMODITY IMPORTS TO EXPORTS. JURISDICTIONAL RISK IS NOW CRITICAL



# The renewables giant: China

CHINESE DOMINANCE OF CLEAN TECH SUPPLY CHAINS IS A STRATEGIC THREAT TO THE WEST

Geographical distribution of the global EV battery supply chain





# Jurisdictional risk-taking

South China Morning Post China Economy HK Asia Business Tech Lifestyle People & Culture World Comment Video Sport Post Mag Style All

Business

## China's proposed export curbs on key solar technologies could backfire, hurt domestic giants, analysts say

- Beijing is mulling export restrictions on technologies used to manufacture large solar wafers, black silicon and ultra-high monocrystalline and multicrystalline silicon
- The proposed restrictions could hinder Chinese firms' expansion plans in Southeast Asia and their ability to develop wafer capacity in the US, Daiwa's Dennis Ip says



Eric Ng + FOLLOW

Published: 5:00pm, 27 Jan, 2023



NIKKEI Asia

World Trending Business Markets Tech Politics Economy Features

SUPPLY CHAIN

## China weighs export ban for rare-earth magnet tech

Beijing looks to strike back after Washington's chip restrictions



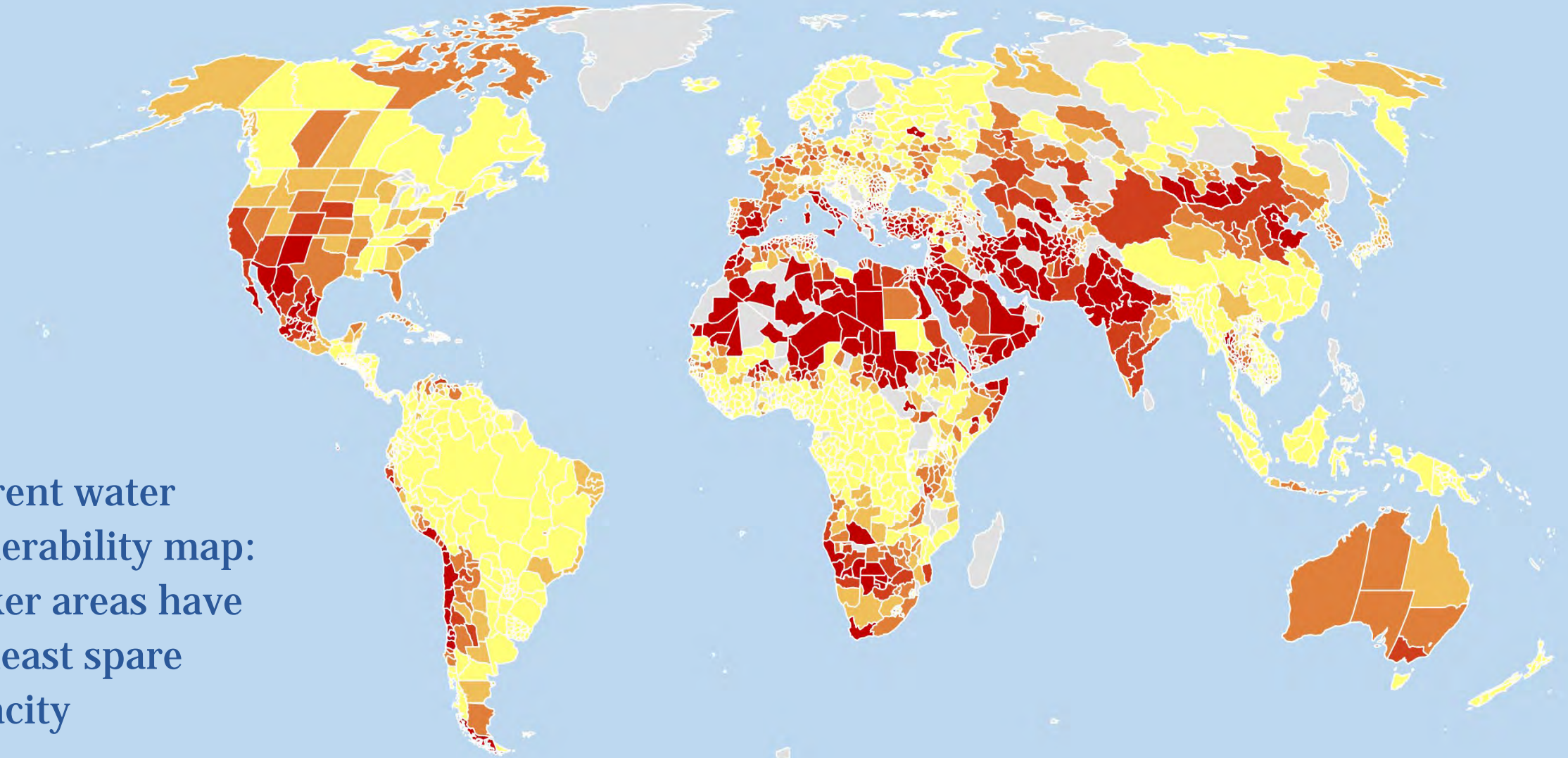
China dominates the global market for rare-earth materials. © Reuters

SHUNSUKE TABETA, Nikkei staff writer

April 6, 2023 00:22 JST

# Water, water, everywhere... but not enough to drink?

Current water  
vulnerability map:  
darker areas have  
the least spare  
capacity





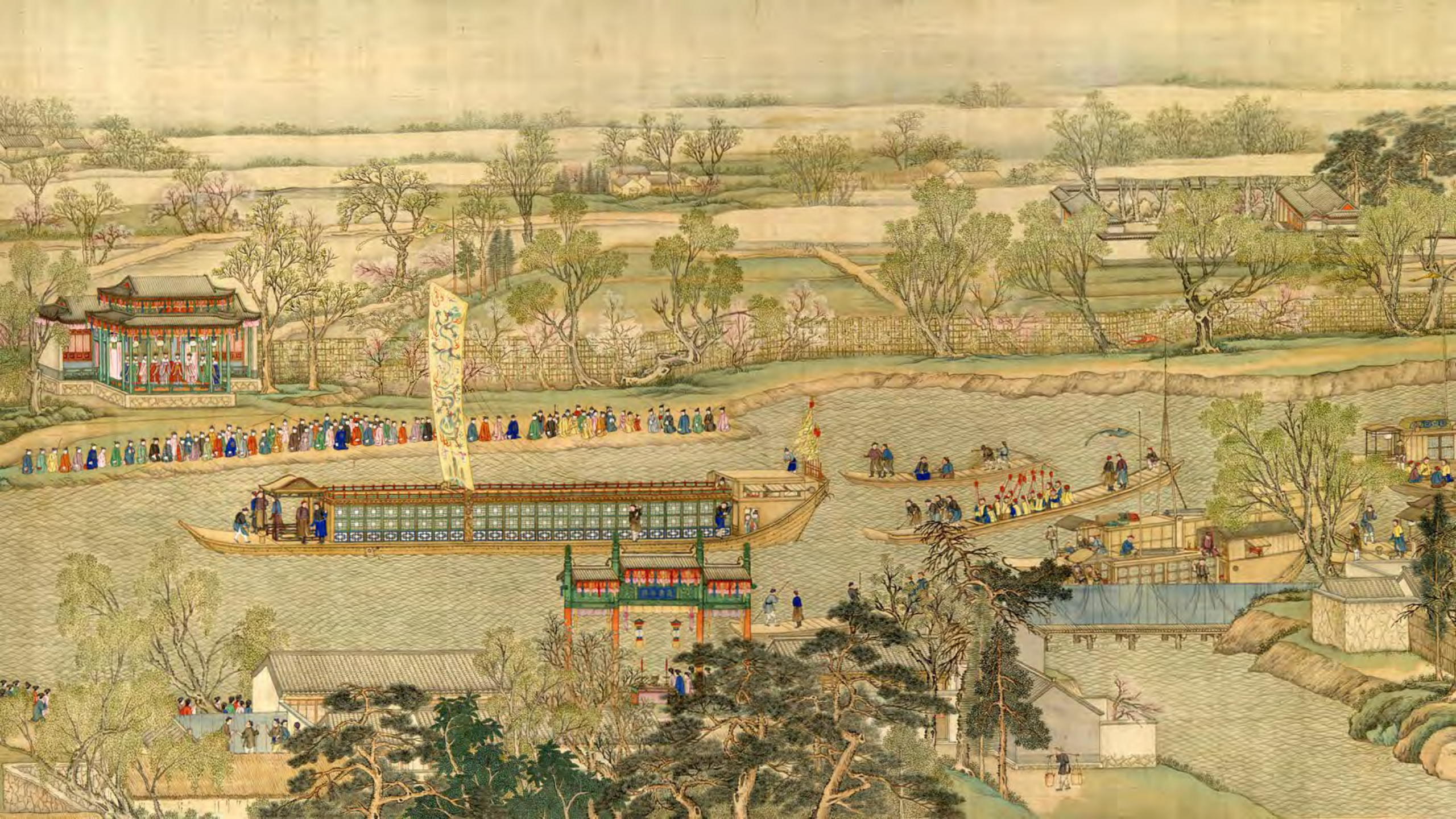
# Dam it all

Hydropower can  
reduce reliance on  
hydrocarbons

...but China's dam  
building spree  
threatens much of  
Asia's water supply









# The politics









# The Inflation Reduction Act

A large iceberg floating in the ocean. The tip of the iceberg is visible above the water surface, while the much larger, jagged base is submerged underwater. Sunlight rays penetrate the clear blue water, creating a dramatic effect. The sky is bright blue with some light clouds.

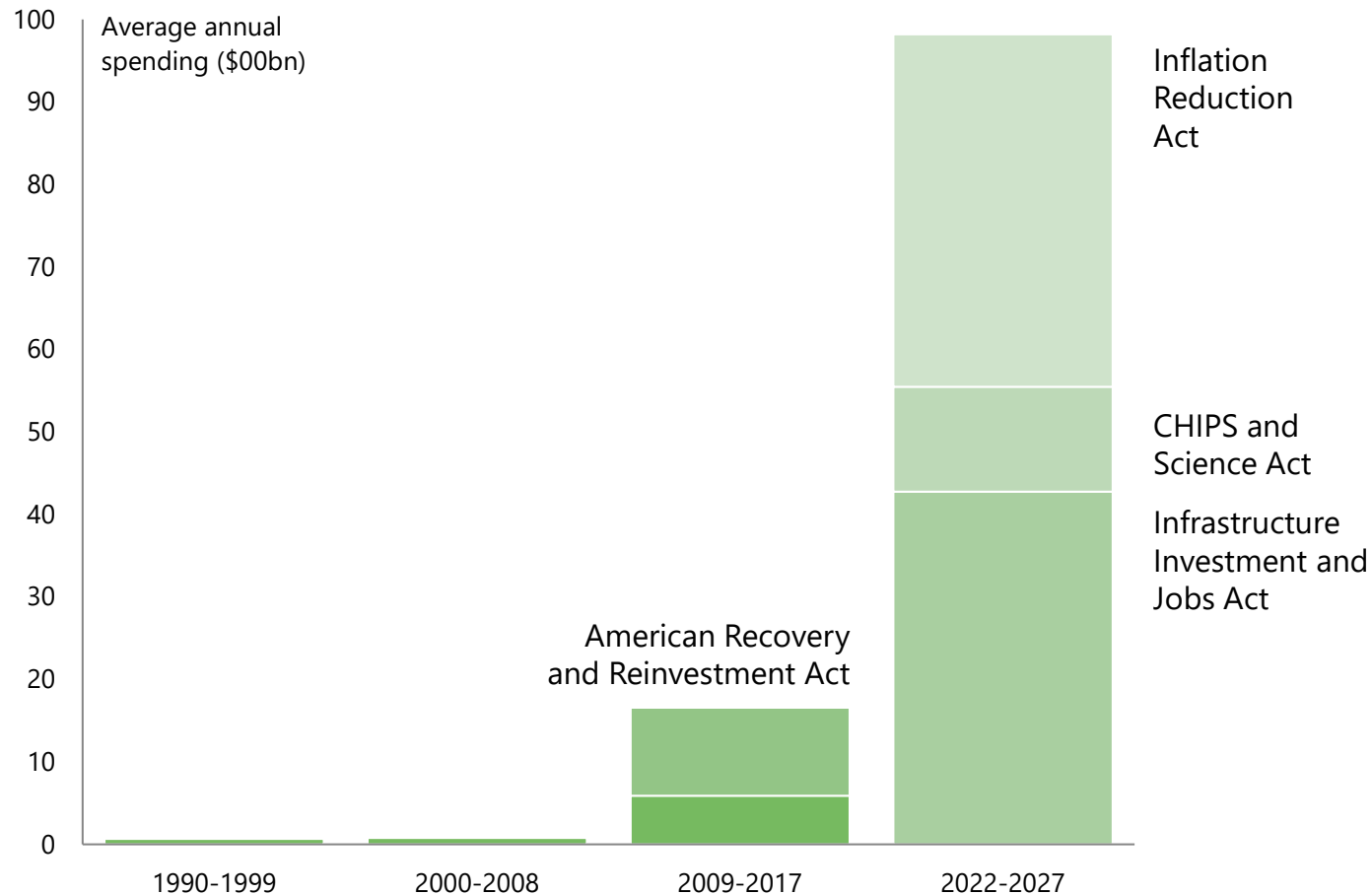
The headline \$369bn  
is the tip of the iceberg

IRA & imitations  
will reshape global  
economy



# Follow the money... industrial policy is back

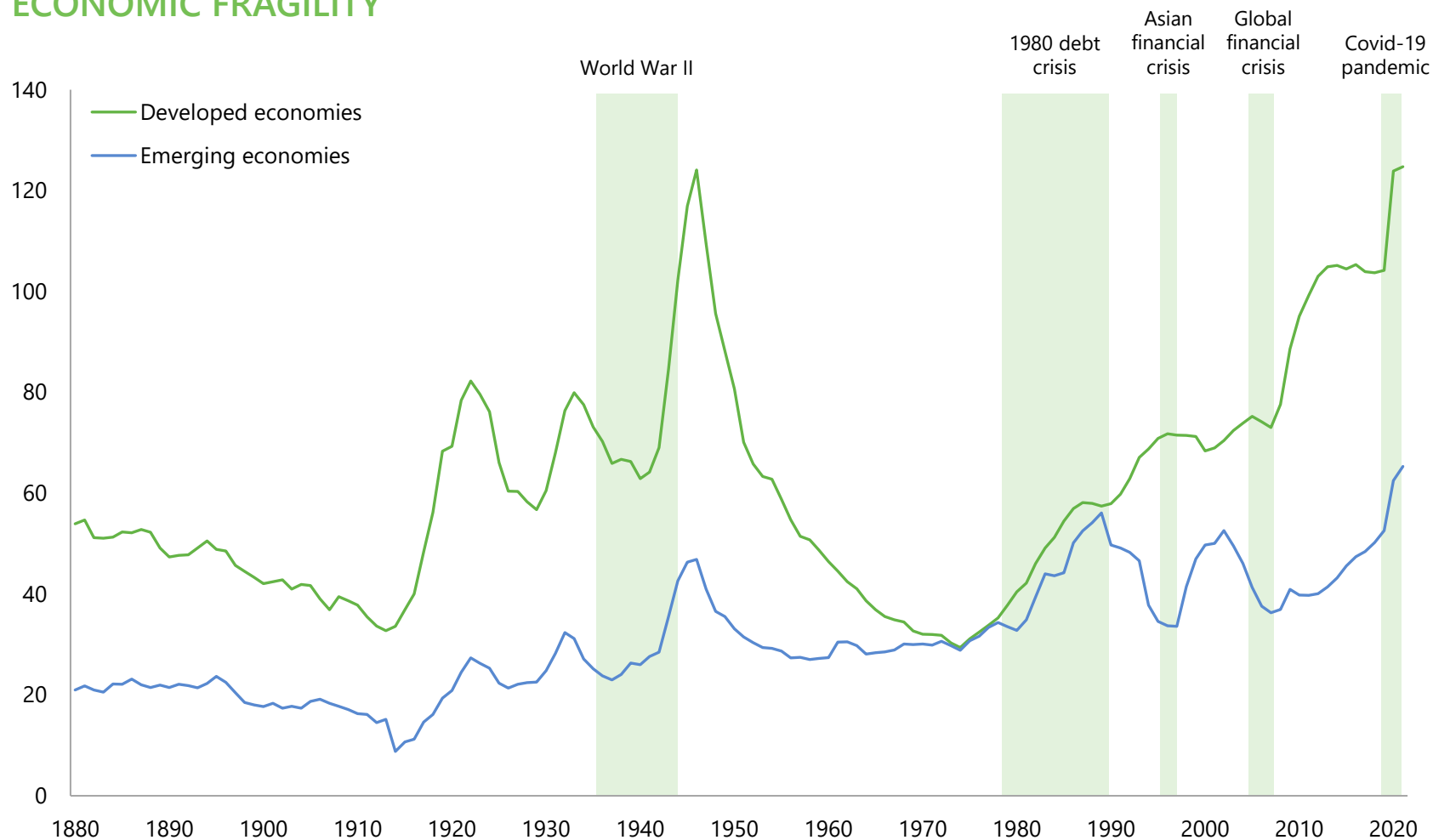
## CLEAN TECH CAPEX BOOM COMING





# How are we going to pay for it?

RECORD LOW YIELDS HAVE DRIVEN DEBT AS A PERCENTAGE OF GDP BACK TO WWII LEVELS, INCREASING ECONOMIC FRAGILITY



**Record debts =  
financial repression  
almost inevitable**

Sources: IMF, Historical Public Debt Database; IMF, World Economic Outlook database; Maddison Database Project; and IMF staff calculations.

Note: The aggregate public-debt-to-GDP series for advanced economies and emerging market economies is based on a constant sample of 25 and 27 countries, respectively, weighted by GDP in purchasing power parity terms.



“...insofar as geopolitics leads to a fragmentation of the global economy into competing blocs, this calls for greater policy cohesion. Not compromising independence, but recognising interdependence between policies, and how each can best achieve their objective if aligned behind a strategic goal.”

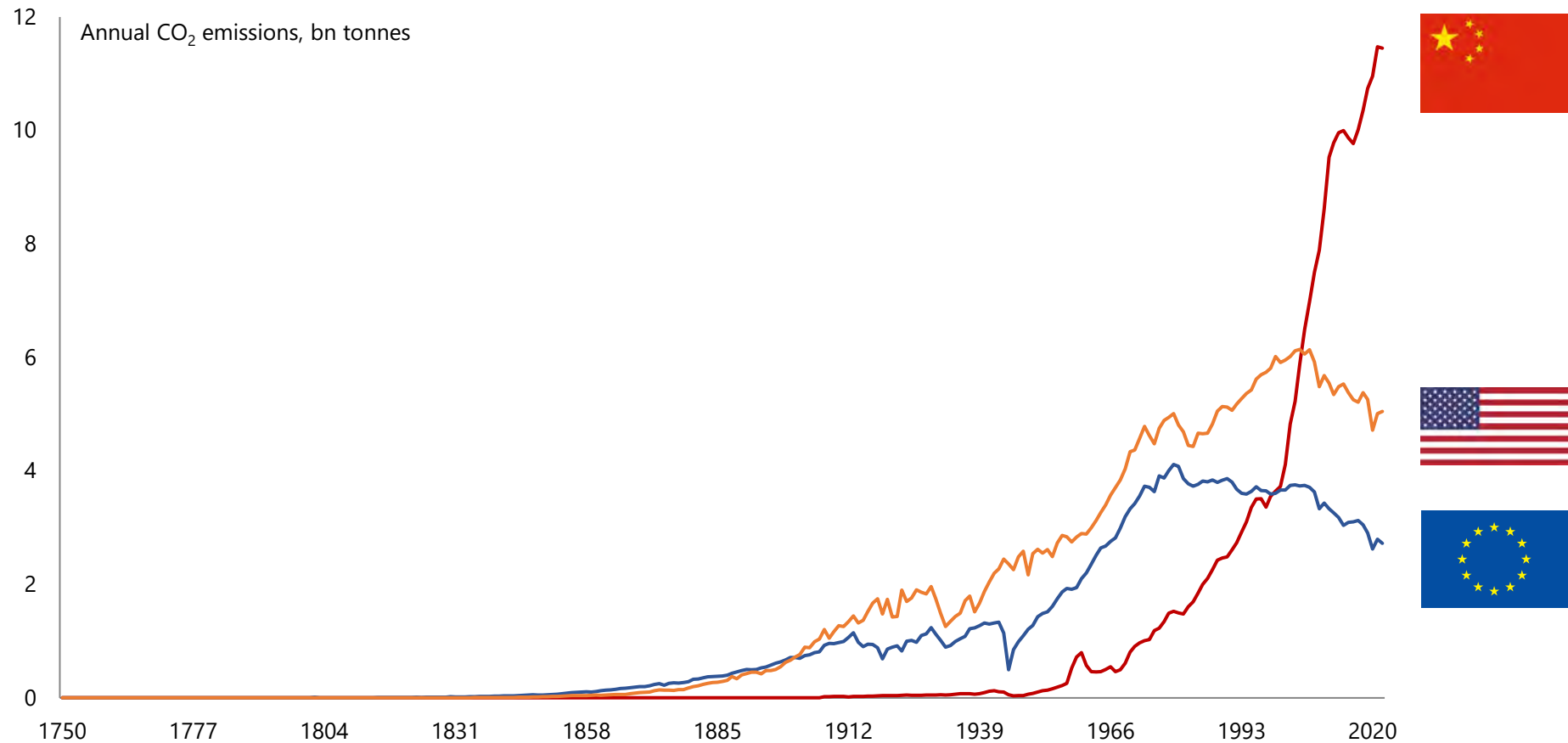
Christine Lagarde, ECB, April 2023





# Geopolitics of carbon = more hot air

THE WEST OUTSOURCED CARBON EMISSIONS TO CHINA. TRICKY POLITICS...

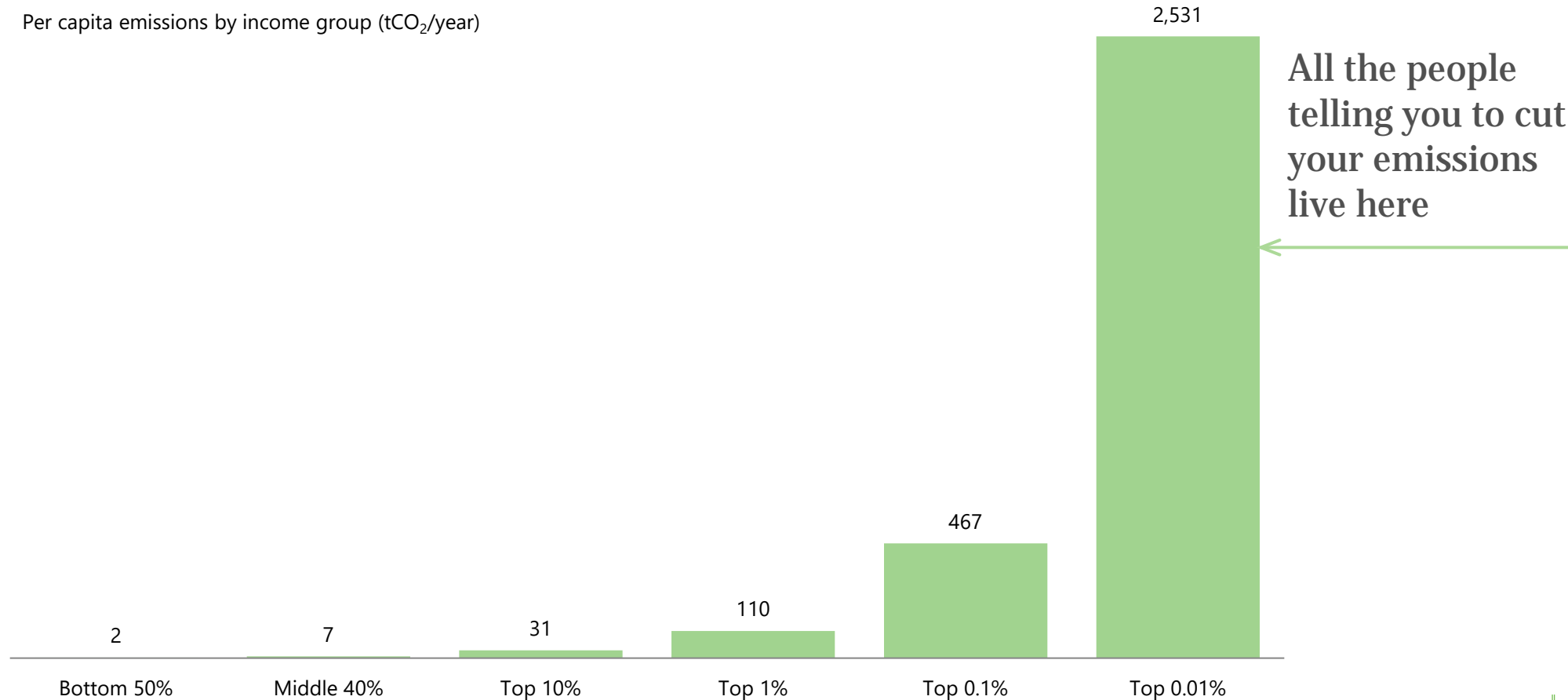




# Pots and kettles?

GLOBALLY, THE RICH EMIT ORDERS OF MAGNITUDE PER CAPITA MORE GREENHOUSE GASES THAN THE POOR

Per capita emissions by income group (tCO<sub>2</sub>/year)

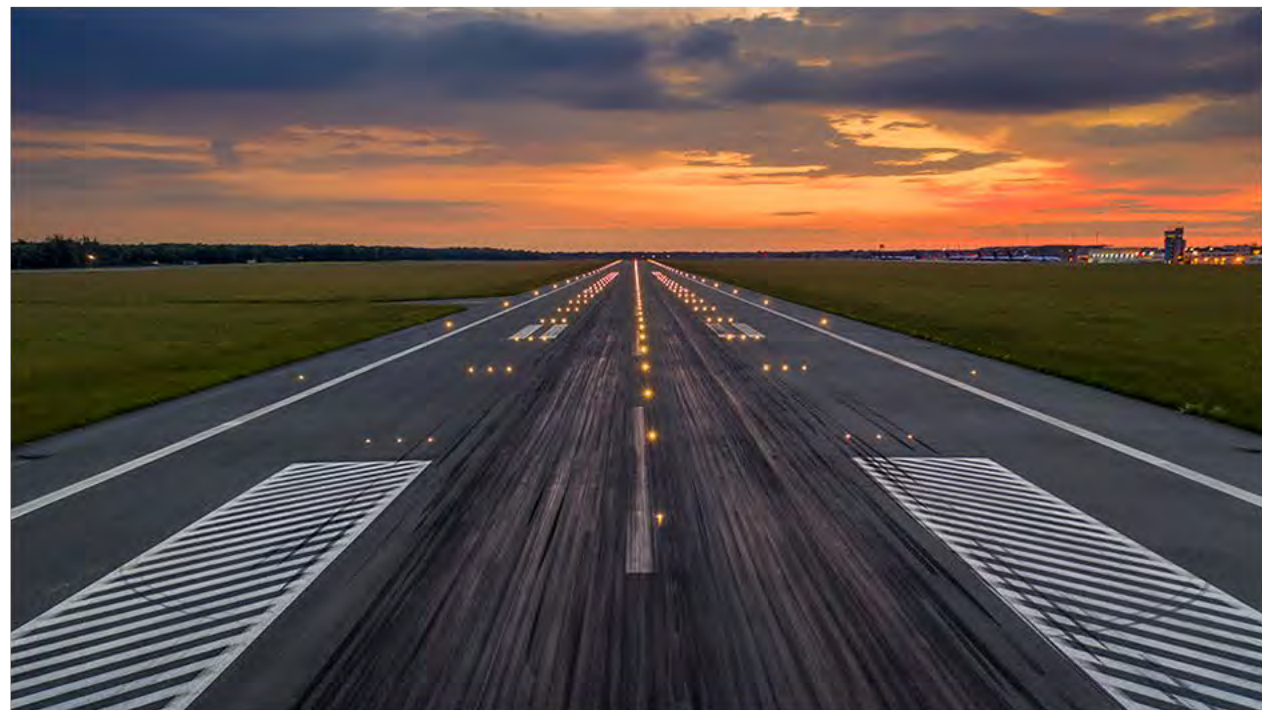




# Sectors



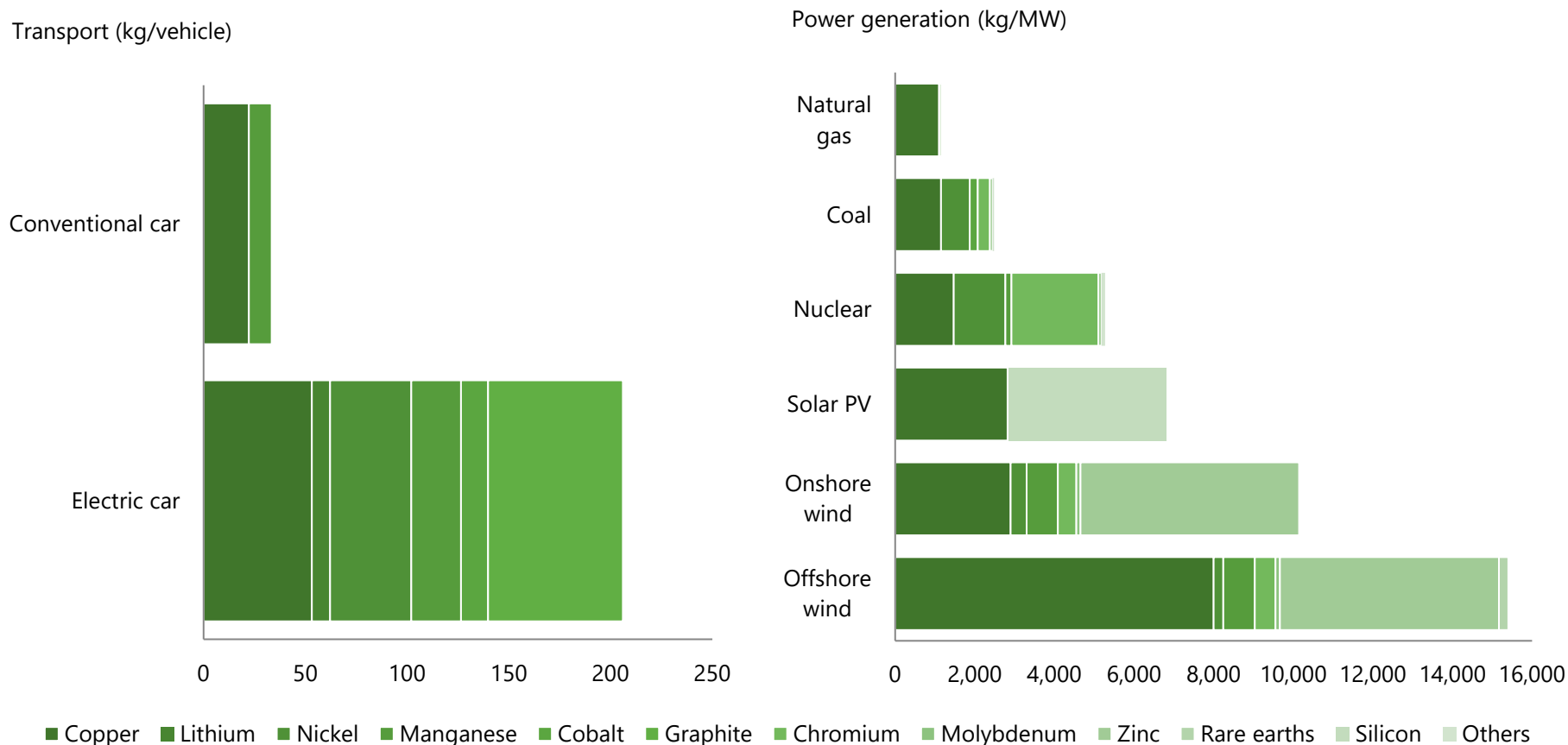






# Mineral inputs in clean energy technologies

RAPID DEPLOYMENT OF CLEAN ENERGY TECH TO SUPPORT NET ZERO IMPLIES MASSIVE EXTRA MINERAL DEMAND



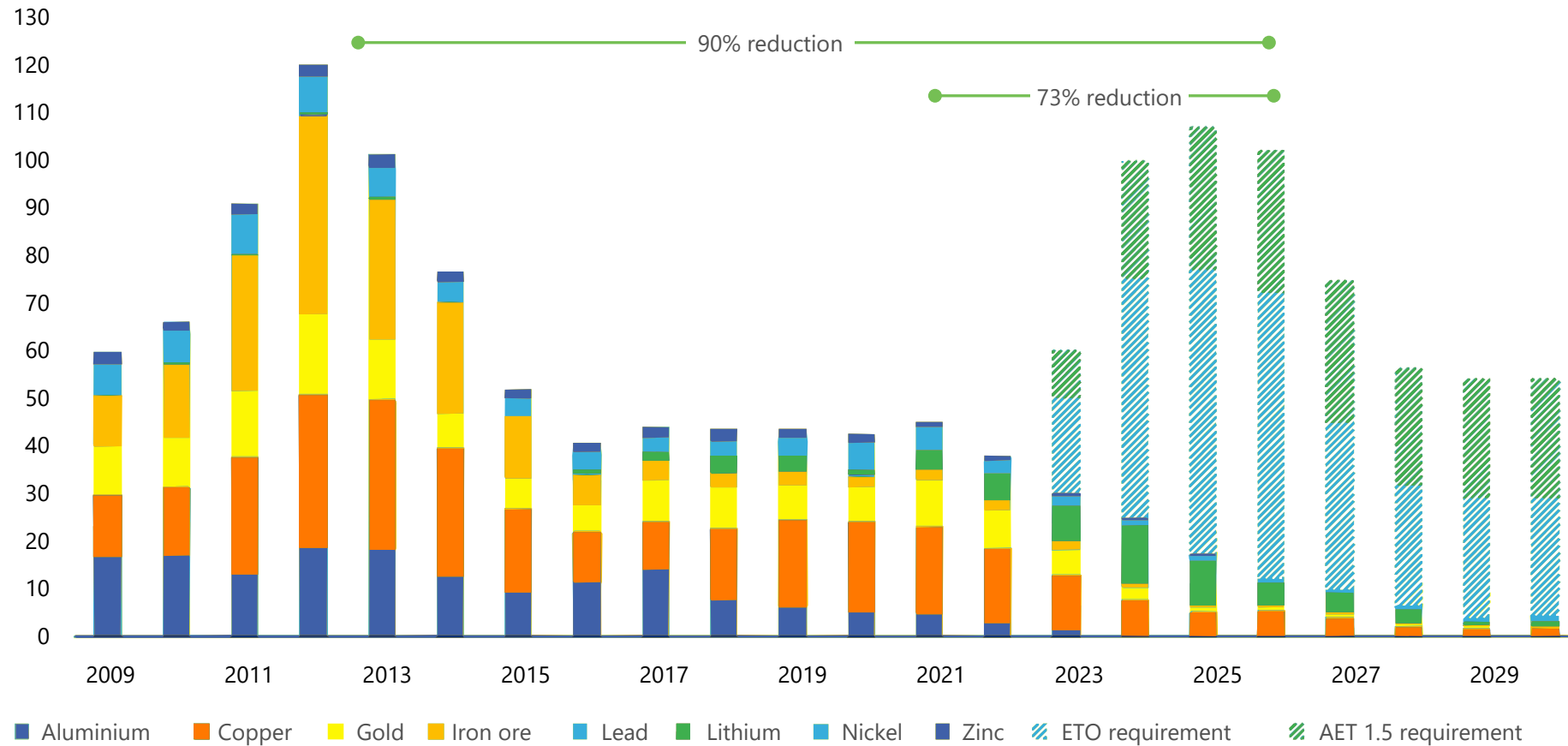






# Mining capex boom ahead?

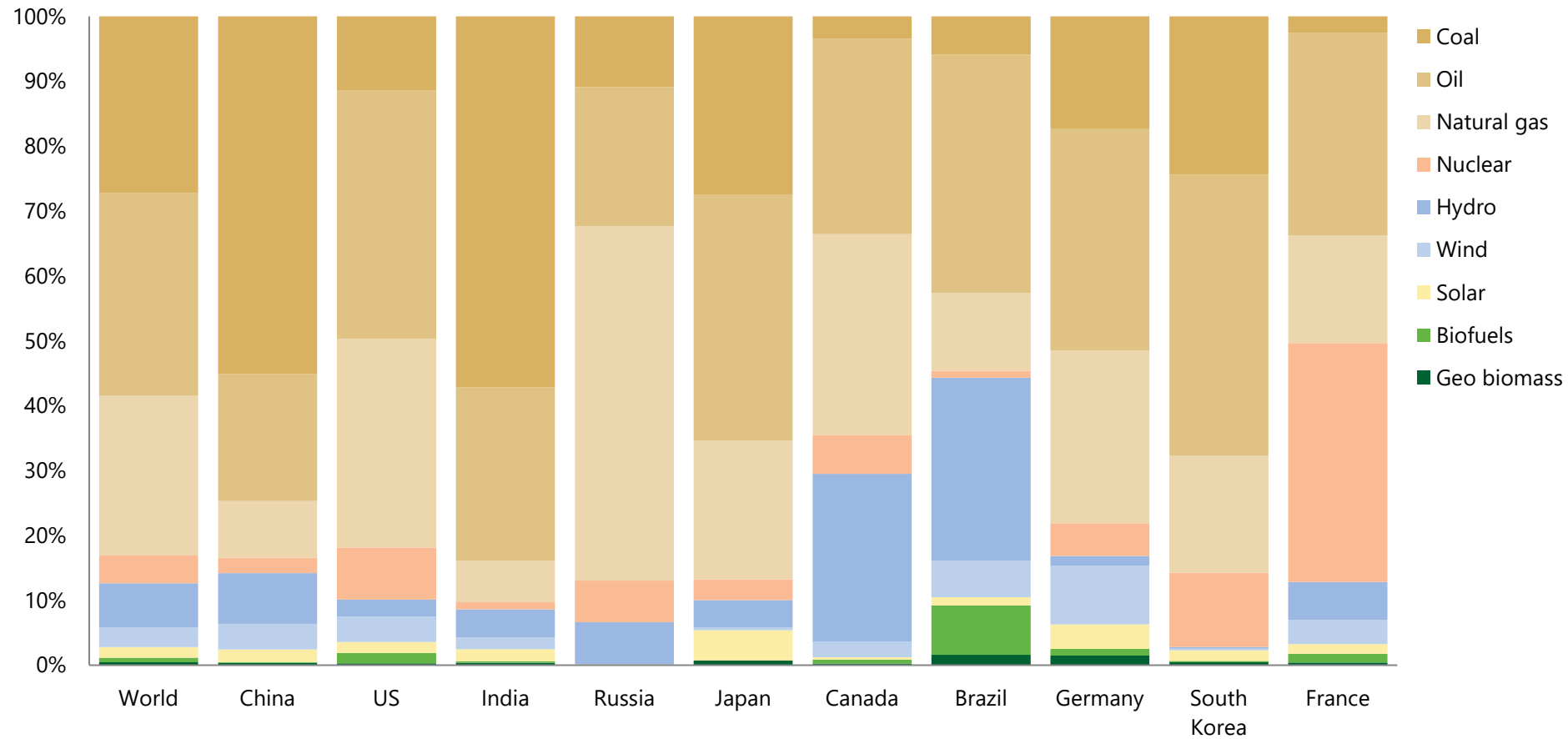
## METALS AND MINING COMMITTED INVESTMENT CAPEX AND REQUIREMENTS, US\$BN





# Fossils fuel our world

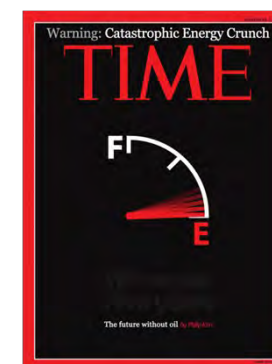
ELECTRICITY GENERATION MIX, WORLD'S TOP 10 COUNTRIES BY ELECTRICITY CONSUMPTION, 2019





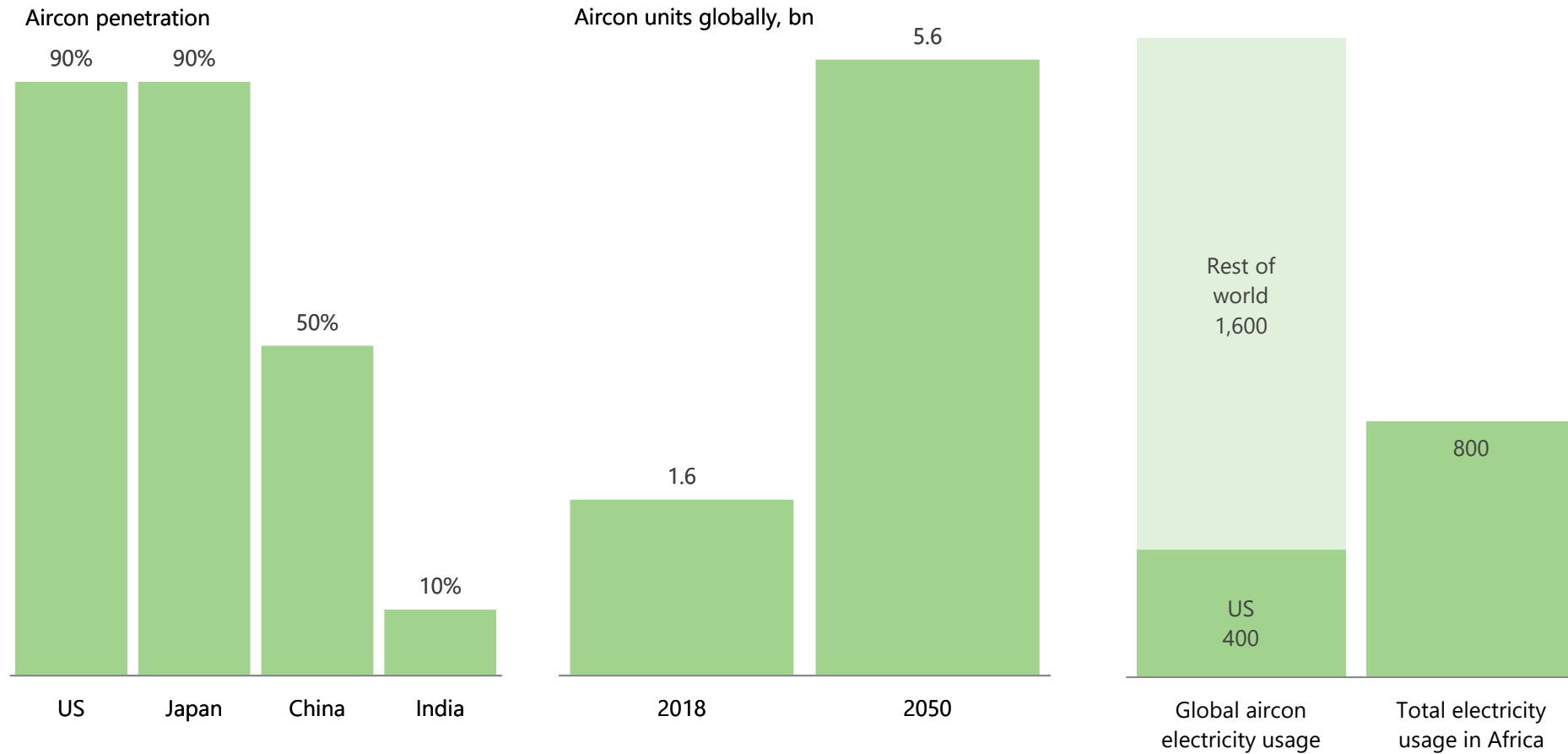
# Energy sector weighting in the S&P 500

MARKET CAP OF S&P ENERGY SECTOR AS A PERCENTAGE OF THE S&P MARKET CAP

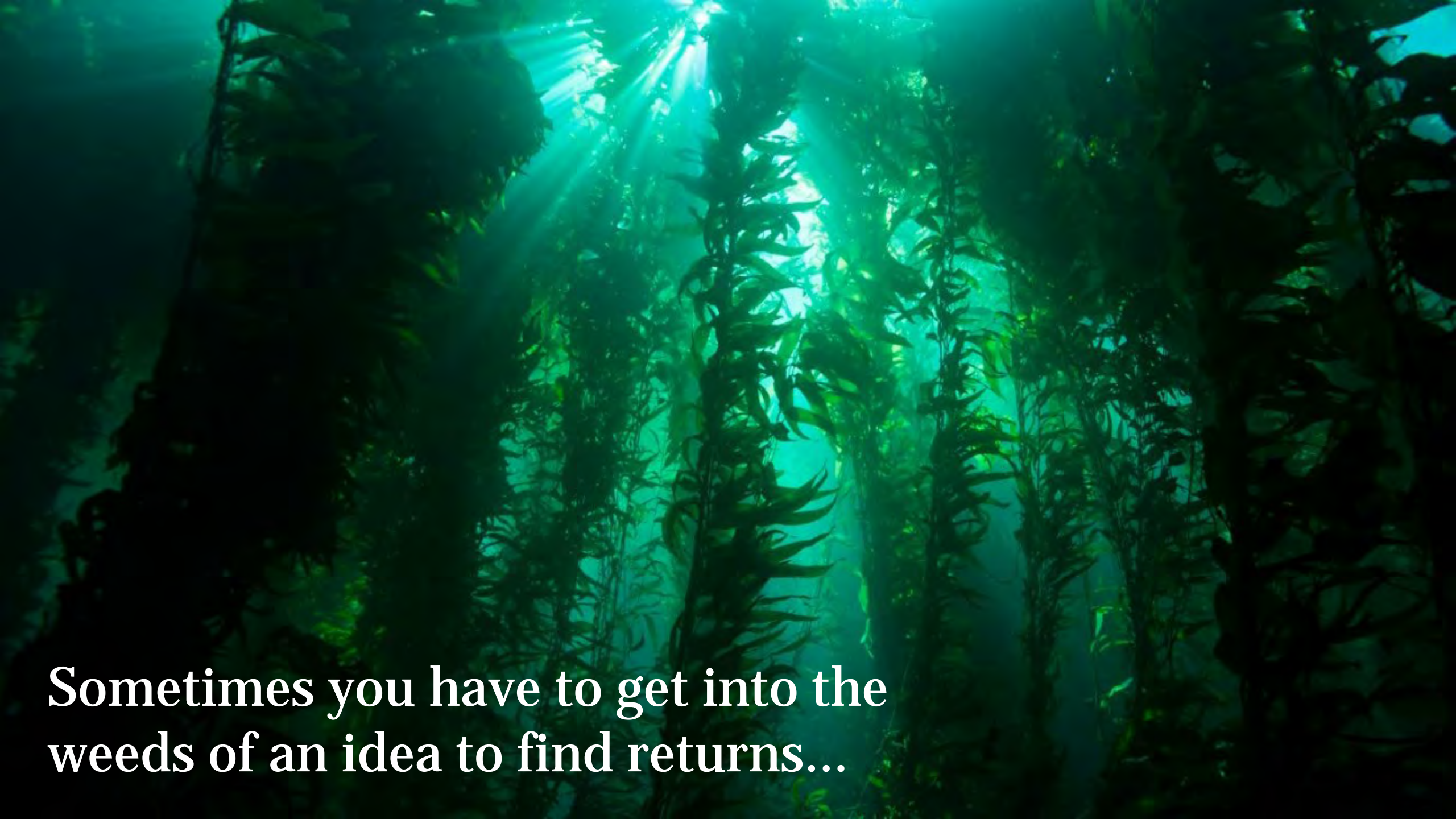


# Long-term climate compounder...

## AIR CONDITIONING AND ENERGY IN NUMBERS



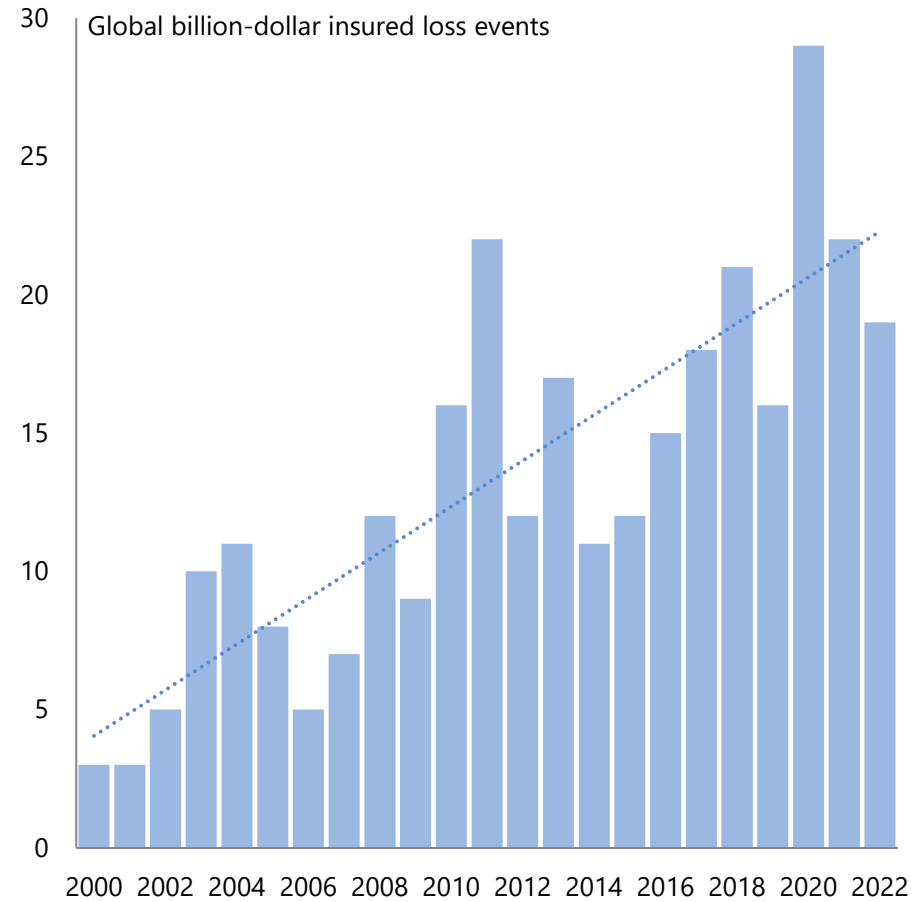
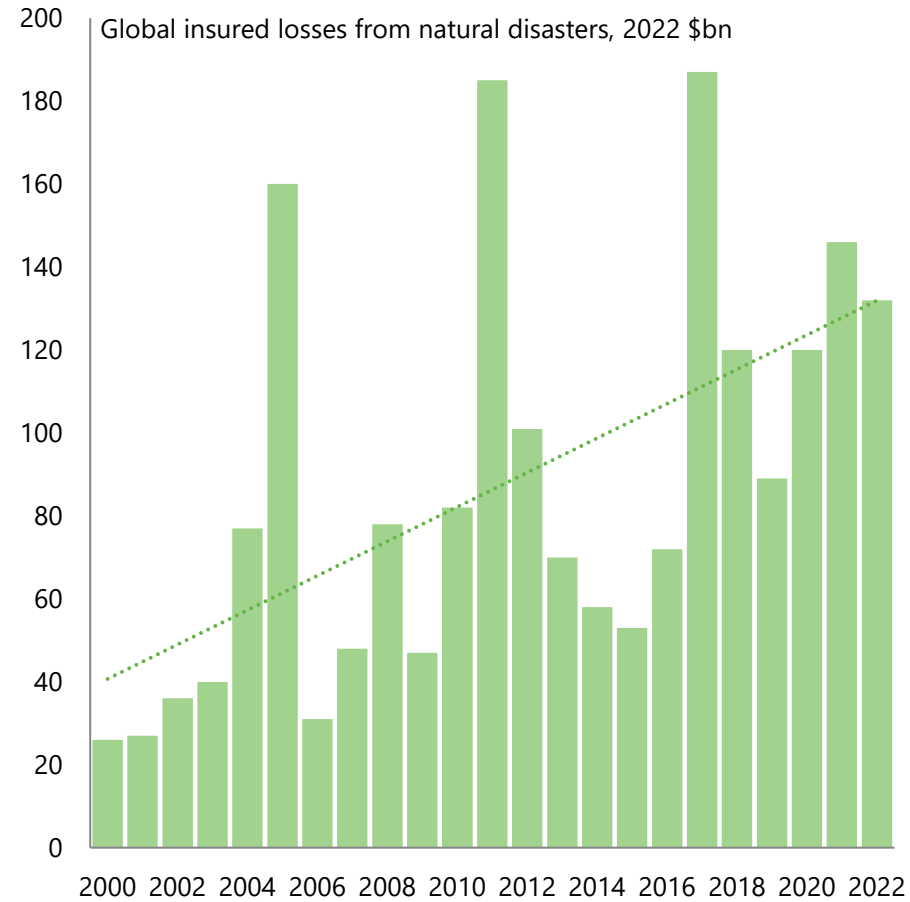




Sometimes you have to get into the weeds of an idea to find returns...

# Environmental volatility is increasing

...AND SO IS THE RISK FOR INVESTORS. THAT SHOULD MEAN HIGHER PREMIA. UNCORRELATED RETURNS?





A N O L I V E R S T O N E F I L M

# Time to look again



## NUCLEAR

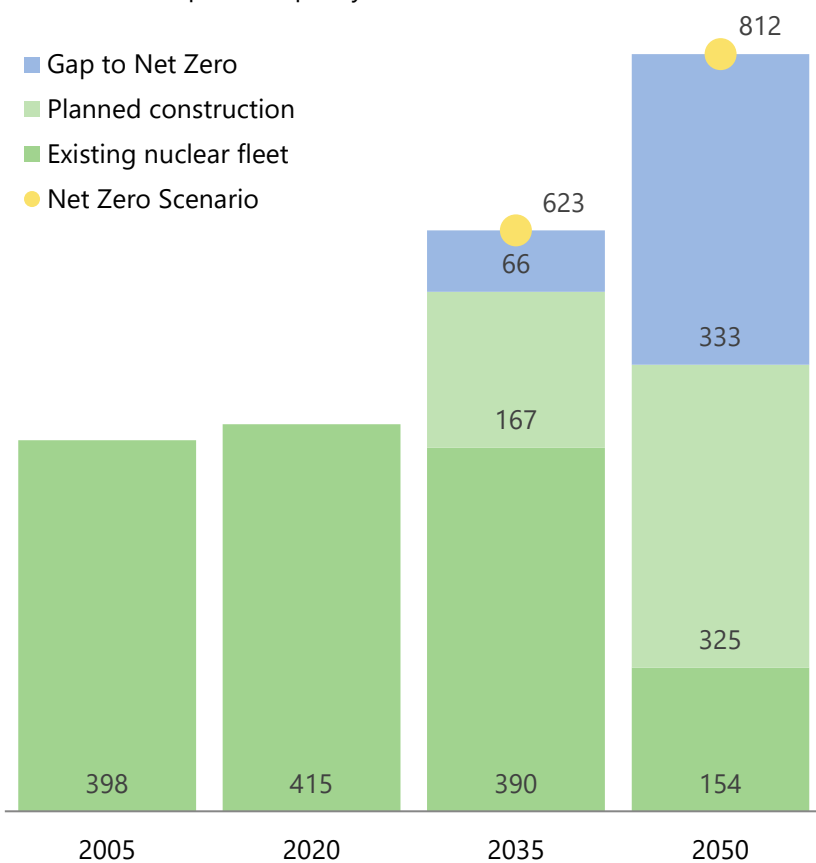
TIME TO LOOK AGAIN

EVEREST COMMUNICATIONS LIMITED presents A NEW ELEMENT MEDIA AND OTJAN PRODUCTION  
"NUCLEAR" by OLIVER STONE. PRODUCED BY JORVAN BEZERRA, KEI, KEIJI MATSUDA, LUCAS FIDUA, KEIICHI AND STEVEN WAKES. EDITOR JON KUK, JOSE LUIS MARTINO  
COSTUME DESIGNER AGATA WOLCZKIN. HAIR AND MAKEUP PHILIPPE BELMANS, LAMARCA H. KOPPEL. EXECUTIVE PRODUCERS "A BRIGHT FUTURE" by JOSHUA S. COLICCHIA & STEPHAN A. DUCK. PRODUCED BY OLIVER STONE & JOSHUA S. COLICCHIA  
WRITTEN AND DIRECTED BY OLIVER STONE

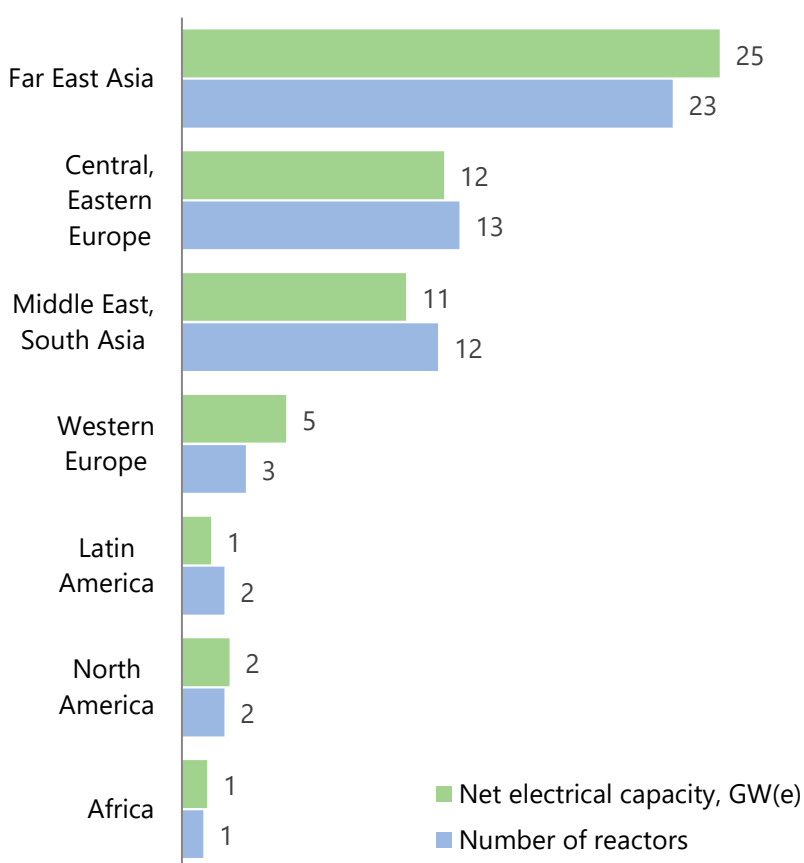
# Nuclear powering-up (again)

ENERGY SECURITY, POLITICAL SHIFTS, CLIMATE GOALS AND NEW TECHNOLOGY DRIVING NUCLEAR RENAISSANCE

Global nuclear power capacity in net zero scenario, GW



Reactors under construction





What's our  
plan?





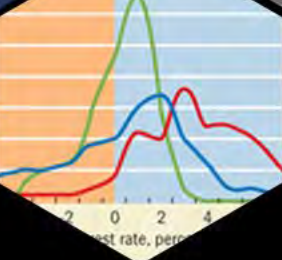






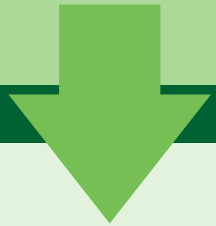
	B Boron		
13	Al Aluminum	14 Si Silicon	
30	Zn Zinc	31 Ga Gallium	32 Ge Germanium
48	Cd Cadmium	49 In Indium	50 Sn Tin
80	Hg Mercury	81 Tl Thallium	82 Pb Lead
112		113 Nh Nihonium	114

 **INFLATION  
REDUCTION ACT  
2022**





Natural risk  
and policy  
responses



more  
inflation-  
prone and  
volatile era

Generational  
risks and  
opportunities

Complexity  
requires  
nuanced  
approach  
to ESG







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