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Predicting the Unpredictable:

The Baltic's Energy Pathway in a
Volatile World

Michael Mehling

Baltic Energy Conference • 2026

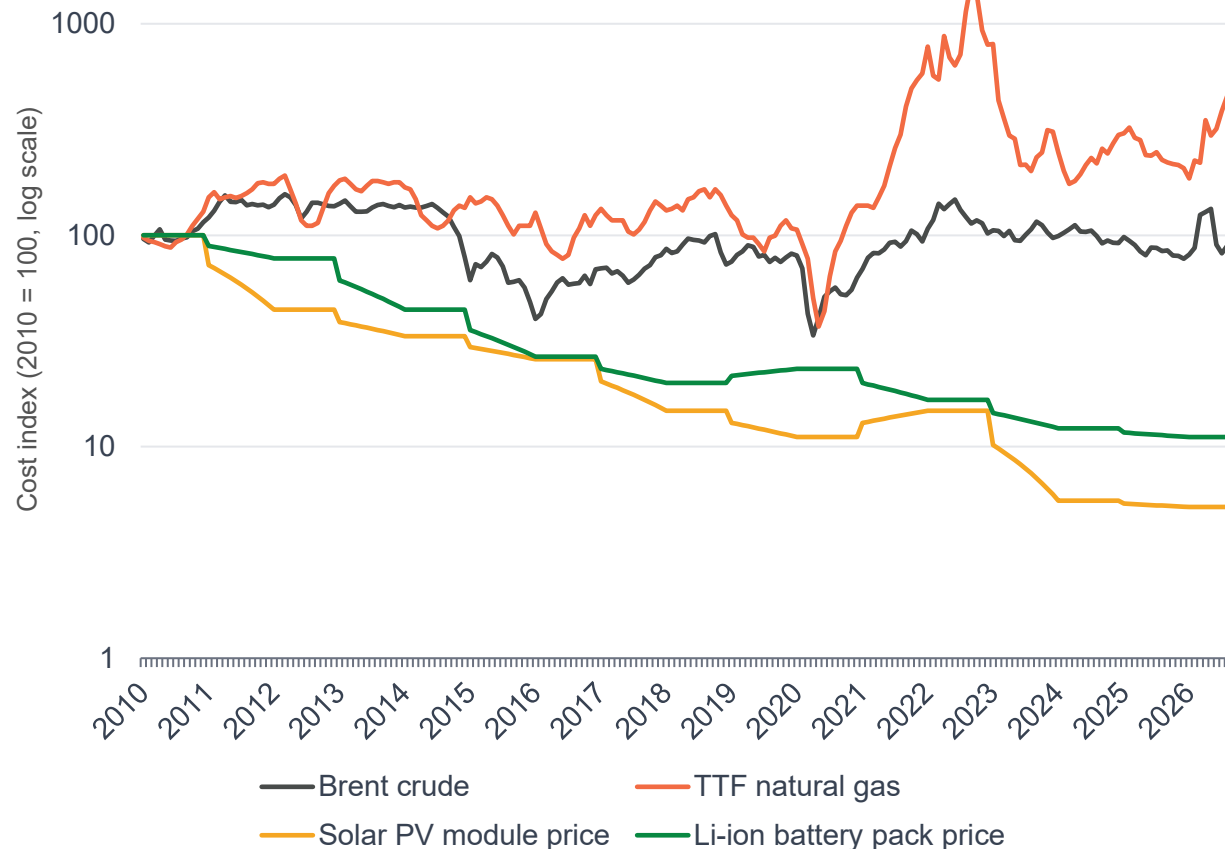


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Volatility Is the New Baseline

Volatile Fossil Prices vs. Falling Clean-tech Costs

(Index 2010 = 100, log scale)



- **Geopolitics sets the price:** fossil prices have stayed volatile for 15 years – the 2022 spike pushed gas ~6x above 2010, and the 2026 Iran/Hormuz shock sent TTF from ~€30 (Jan.) to ~€73/MWh (Sept.)
- **Clean costs keep falling:** since 2010 solar PV module and Li-ion battery pack prices have fallen ~90%; the downward trend continues, but does not automatically relieve end user cost burden.
- **Policy follows the price:** each price spike reopens debates on energy market interventions, climate policies, and supply chain dependencies, turning market volatility into policy volatility.

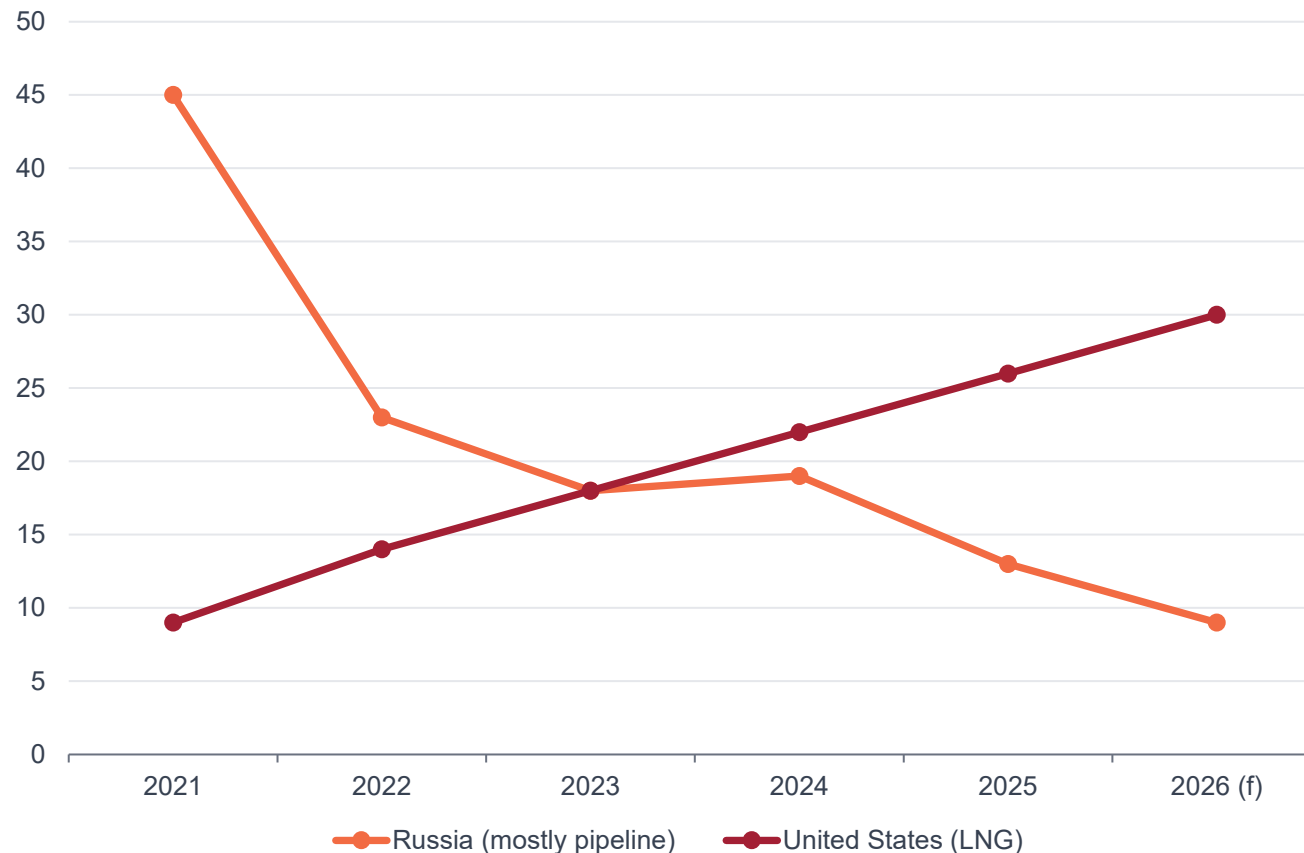
Sources: based on ICE / Trading Economics TTF and Brent (indexed); IRENA (2025); BloombergNEF battery index.



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From One Dependence to Another?

Russia vs. U.S. Share of Total EU Gas Imports
(Pipeline + LNG combined, % of total)



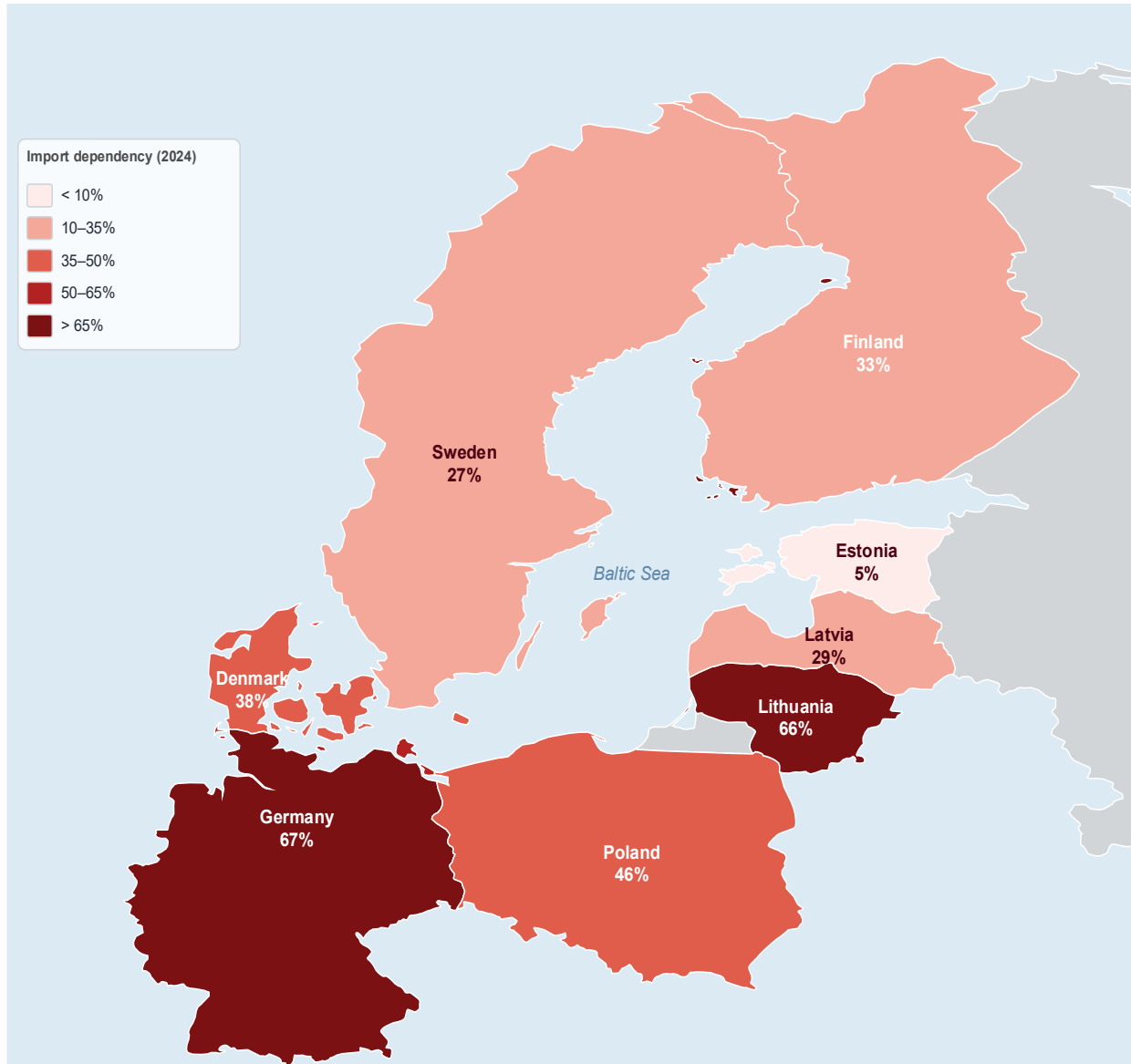
Source: based on Eurostat (2026), [Energy in Europe 2026](#), and other data points

- **Russia out, the U.S. in:** Russia supplied ~45% of EU gas in 2021, mostly by pipeline; falling to ~12-15% by 2025. The U.S. is now the EU's top LNG supplier accounting for ~57% of LNG imports (Q1/2026), and could overtake Norway as its largest gas supplier overall in 2026.
- **Volatility increases:** U.S. seaborne LNG pricing is affected by volatile global spot markets and has high liquefaction costs relative to other suppliers; fixed-pipe leverage has thus been replaced by global price exposure.
- **Still buying from Russia:** Russia is still the EU's #3 gas supplier, now mostly via LNG and the TurkStream pipeline; a full import ban phases in through 2027.



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Baltic Region: Energy Import Dependence



Source: based on DeStatis, [Energy dependency rate](#) (Sept. 2026)

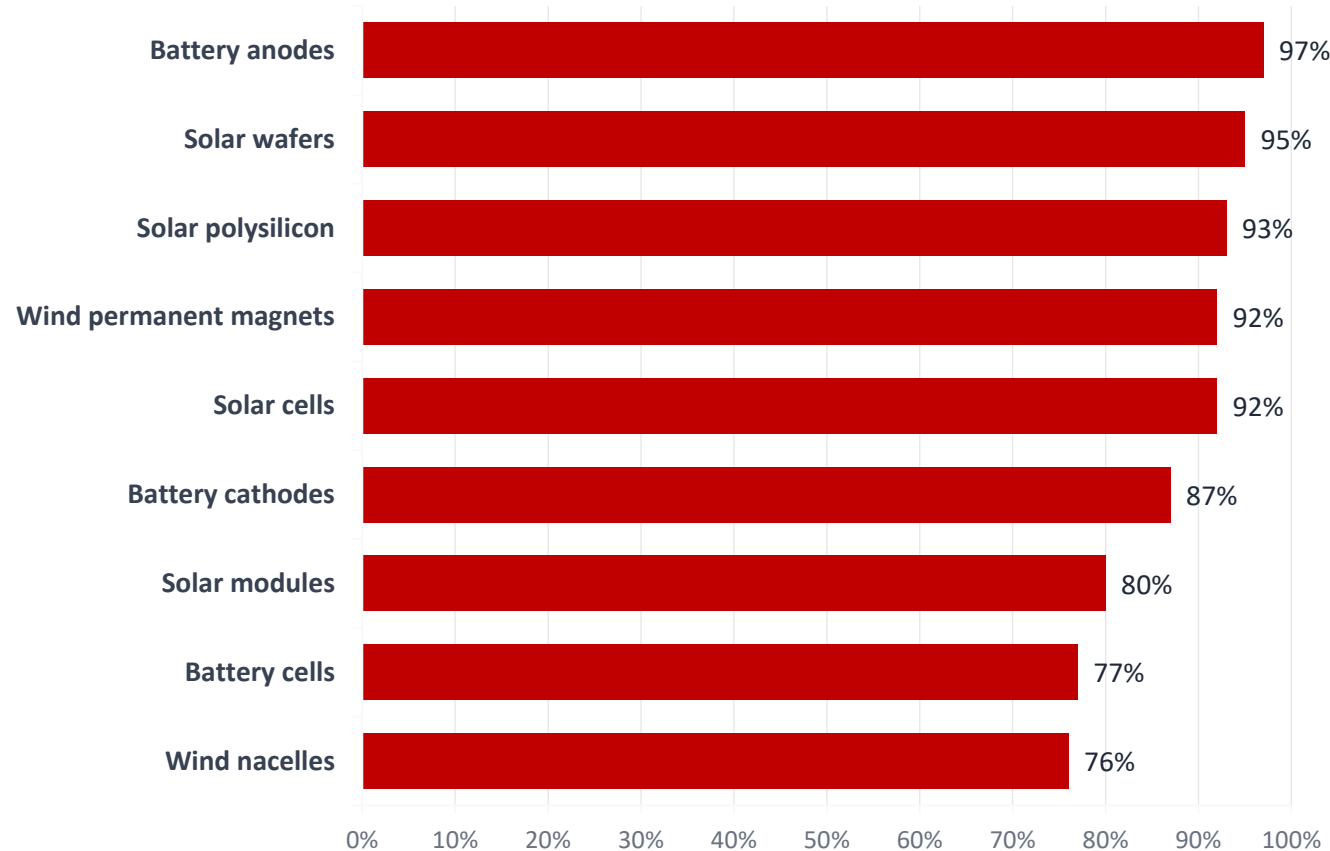
- The Baltic states diverge sharply (Estonia 5% to Lithuania 66%), but the region overall tracks close to the EU average (~57%): vulnerabilities also differ for smaller economies with less bargaining power and fewer supplier options
- Germany (67%) and Lithuania (66%) are most exposed: both rely heavily on imported fuels. Finland (33%), Sweden (27%), and Denmark (38%) are far less exposed, thanks to nuclear, hydro, wind, and biomass.
- Estonia (5%) is an outlier: Estonia's score reflects domestic oil shale production (the world's largest oil shale energy sector), plus Soviet-era infrastructure that has left Estonia nearly self-sufficient.



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The Next Chokepoints: Minerals and Components

China's Share of Global Clean-tech Manufacturing Capacity, by Technology



- China dominates the inputs: ~70% of global mineral refining and ~90% of rare-earth magnets – the components inside wind turbines, EVs, grids and electrolyzers.
- Leverage is now a policy tool: 2025 export controls on rare earths sent some prices up several-fold; some Chinese restrictions are currently suspended, but only to Nov 2026.
- Diversification takes years: the EU's Critical Raw Materials Act and allied "friend-shoring" are advancing, but (re)building refining and magnet capacity is a decade-long effort.

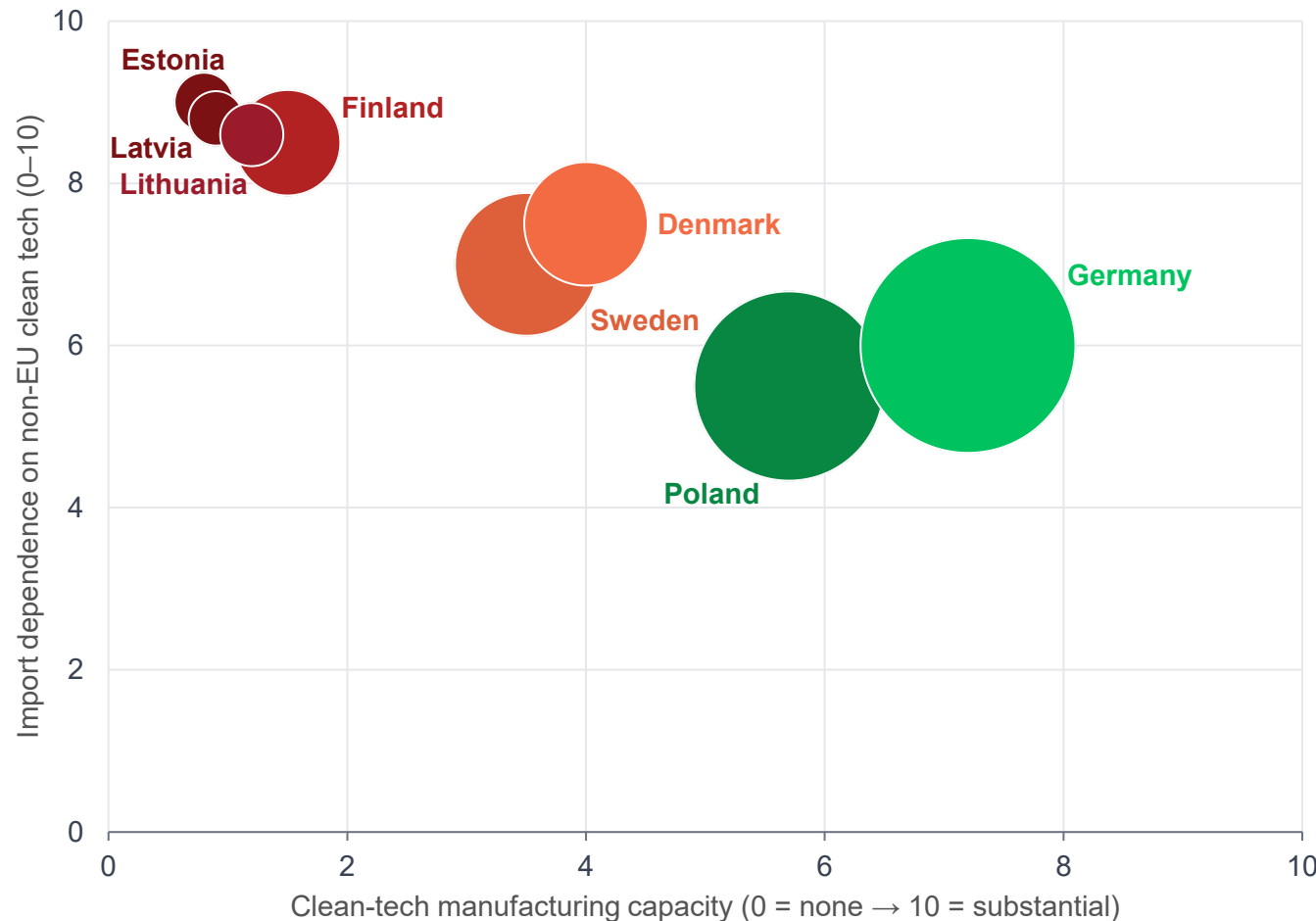
Sources: IEA (2026), [Energy Technology Perspectives 2026](#); Concordel/Ho/Knittel et al. (2026), [The Differential Impacts of Critical Mineral Prices and Oil Prices on the Economy](#).



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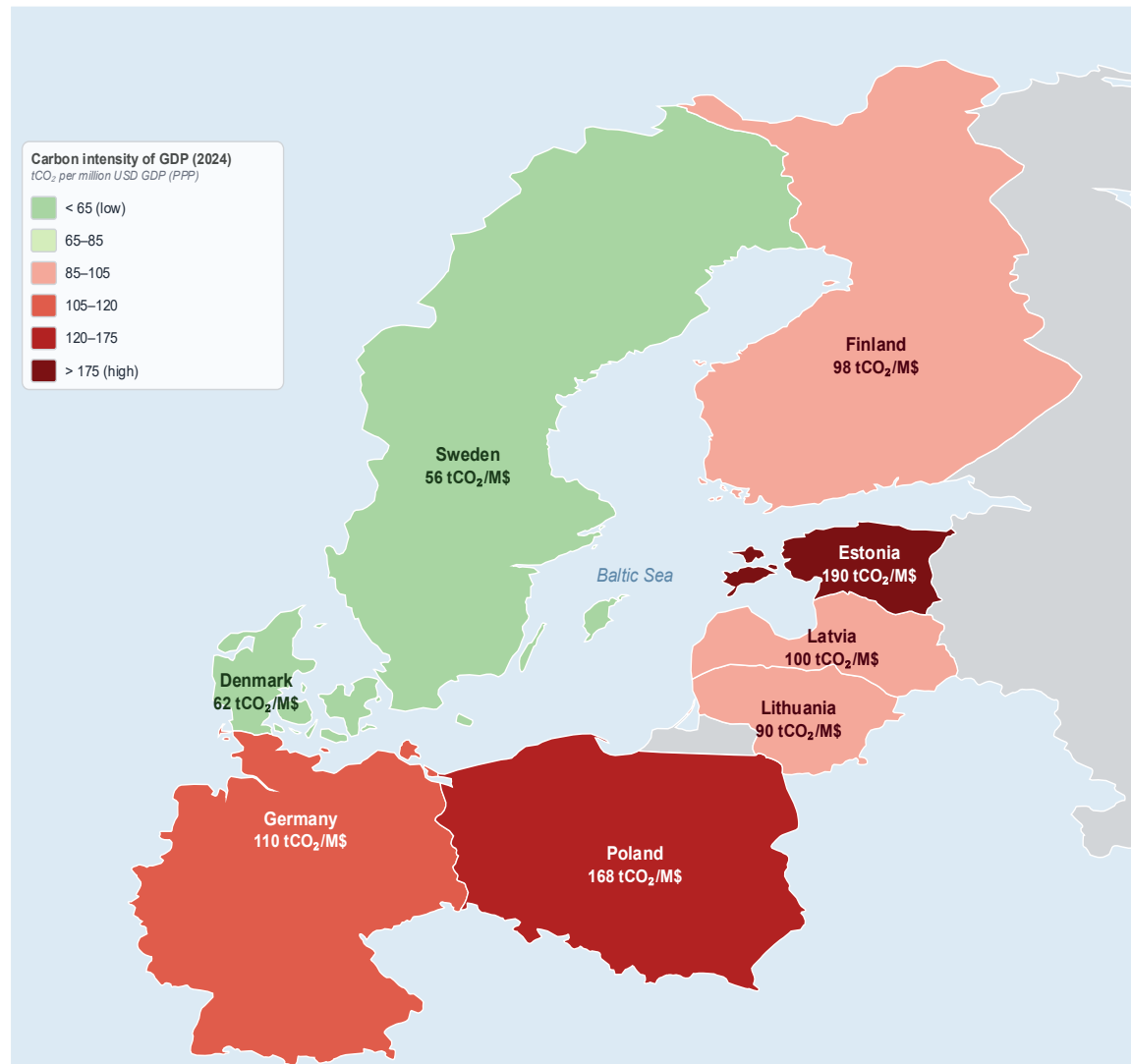
Baltic Region: Clean-Tech Import Exposure

(Illustrative index; bubble size = economic weight)



- **Poland leads on batteries, Germany overall:** its gigafactories (LG in Wroclaw ~35% of EU cell capacity) rival Germany's, but Germany leads aggregate clean-tech and solar-PV manufacturing.
- **Some capacity is largely foreign-owned:** <80% of European battery output is built by Korean firms (LG, SK, Samsung SDI), with Chinese investment now arriving, so domestic capacity does not fully remove foreign dependence.
- **Small economies are most exposed:** the Baltics have limited clean-tech manufacturing and rely almost entirely on imported components – highest import dependence, smallest economic weight.

Baltic Region: Carbon Intensities Diverge



Source: EDGAR 2024 (JRC/IEA) fossil CO₂ ÷ GDP (PPP)

- Sweden and Denmark show what structural decarbonisation can look like: both have cut carbon intensity roughly in half since 2000. Sweden's nuclear and hydro base has anchored low-carbon electricity for decades; Denmark has built wind to over 55% of its power mix.
- Poland and Germany are in transition: in Poland, rapid renewable deployment begins to shift the mix; Germany has more than halved its intensity since 2000 but industrial demand and residual fossil reliance keep it well above the Baltic-region leaders.
- Estonia is the EU's outlier: its oil shale power sector is unique in the world, burning solid fossil fuels for electricity; yet the picture is changing: oil shale's share in electricity generation has fallen from ~90% in 2010 to ~35% by 2024 as solar and wind scale up rapidly.



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Policy Backlash and the Carbon Pricing Rollercoaster

EU ETS Carbon Price (EUA), 2005–2026

(Monthly data, €/tCO₂; front-month contract)



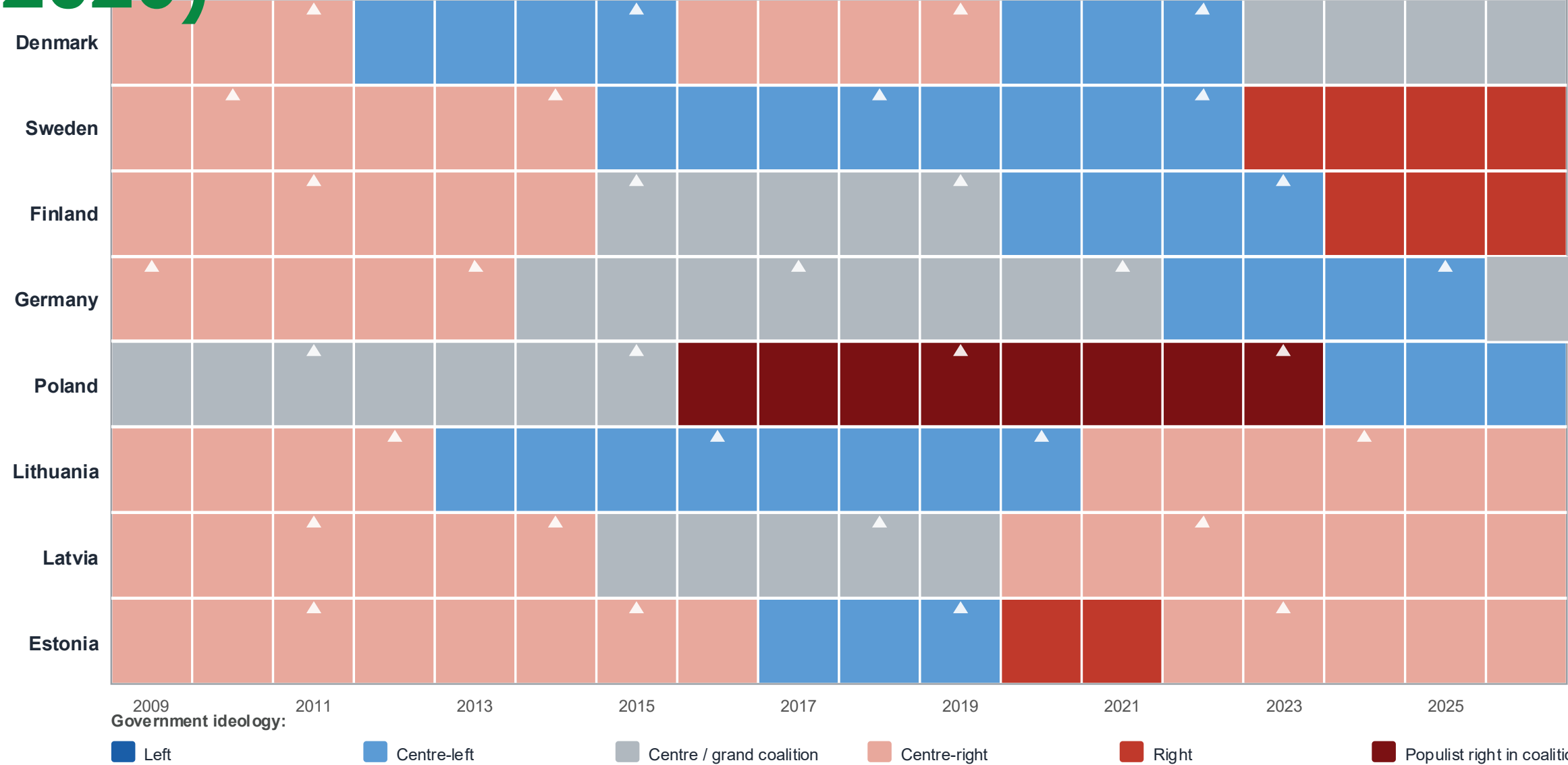
Sources: based on [ICAP](#); [Trading Economics](#); [Bruegel](#) (2026)

- **Policy uncertainty moves the price:** the EU ETS price hit ~€92 in January 2026, then slumped to well under €70 in March amid Member State pressure for reform, recovering to ~€83 by August.
- **The 2026 ETS review has been a wild card:** debates over free allocation, ETS2 timing, and a role for international credits injected uncertainty into EU carbon pricing, resulting in some adjustments to the pace of decarbonization and more flexibilities.
- **Yet European investment holds steady:** as U.S. clean-tech investment falls on policy reversal and Chinese investment slows, EU manufacturing investment remains broadly stable for now.



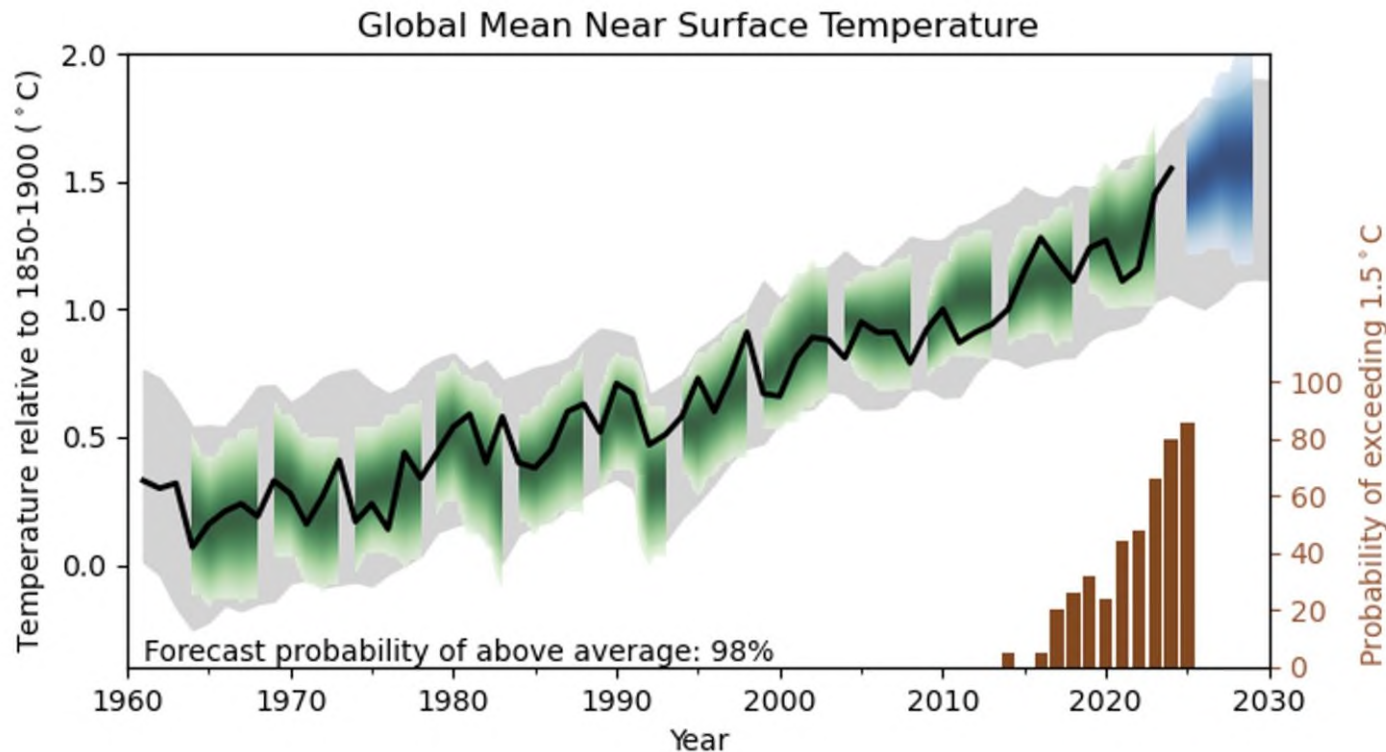
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Baltic Region: Electoral Politics (2009-2026)



One Certainty: Climate Continues to Change

Multi-Year Predictions of Global Mean Near-Surface Temperature Relative to 1850-1900



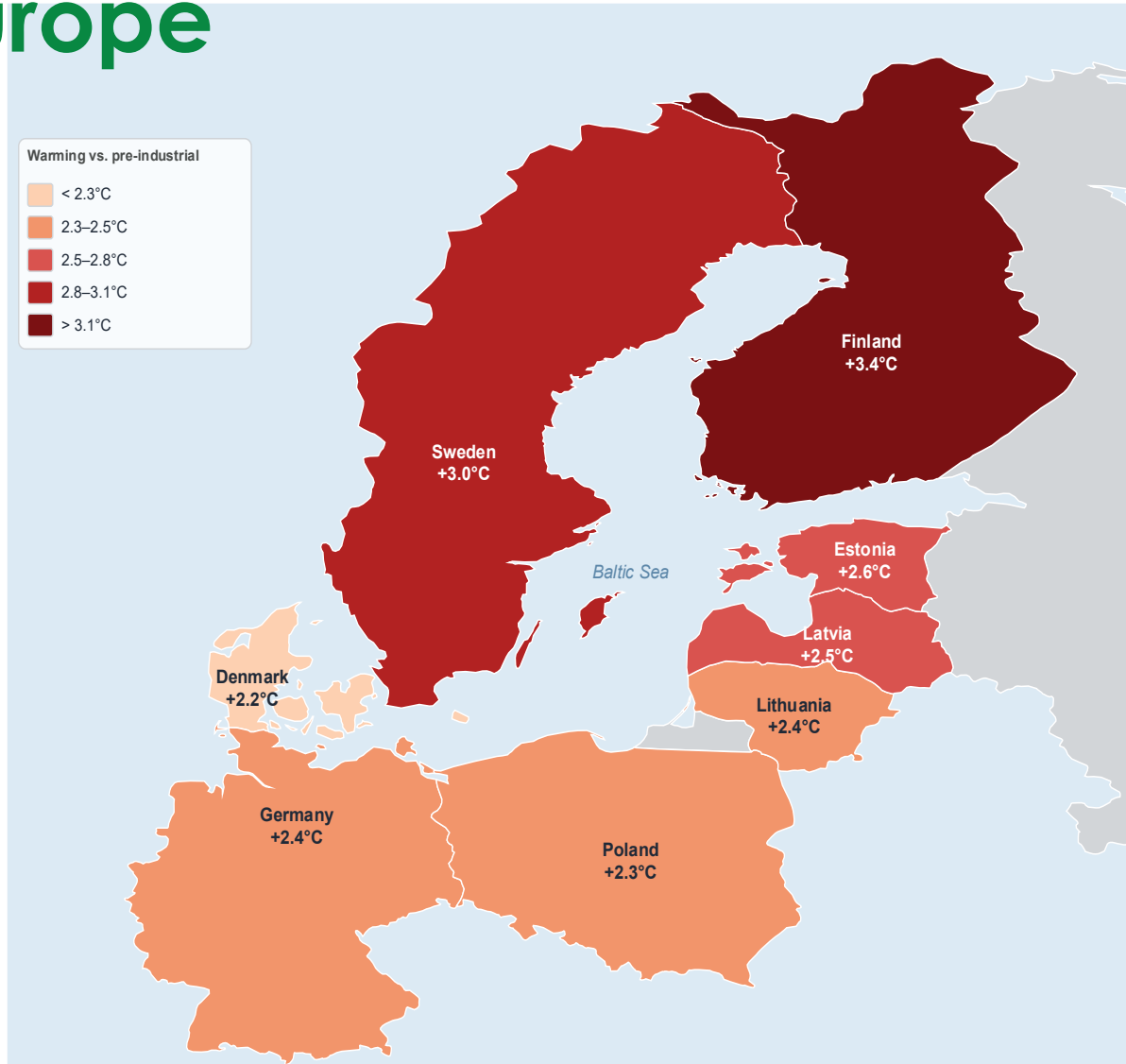
Source: WMO (2026), [WMO Global Annual to Decadal Climate Update 2026-2035](#).

- Climate change is not pausing: the WMO now puts a 91% chance that a year before 2030 temporarily exceeds 1.5°C; 2024 was the warmest year on record at ~1.55°C.
- Costs are already landing: Europe is warming faster than the global mean, with heatwaves, droughts and floods already straining energy systems and public budgets.
- This is one rare constant: energy costs, suppliers and politics swing year to year, but the physical case for decarbonisation keeps strengthening.



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Baltic Region: Warming Faster than the Rest of Europe



Source: based on Copernicus Climate Change Service (C3S), [European State of the Climate 2025](#)

- The region warms faster than the global mean (+1.3°C) and even faster than the European average (+2.4°C), particularly Finland and Sweden, driven by Arctic amplification and declining snow/ice cover.
- Northern countries warm fastest: Finland's +3.4°C is more than twice the global average, driven by Arctic proximity; the gradient from Finland southward to Denmark/Poland is steep and systematic.
- So the direction is the fixed point: longer fire seasons, changing precipitation and storm patterns, earlier ice melt, and more weather extremes; Baltic Sea surface temperatures have risen faster than the global ocean mean.

Coping with Uncertainty: Insights from Theory



Frank H. Knight
(1885–1972)

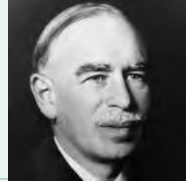
Uncertainty not Same as Risk

“It will appear that a measurable uncertainty, or ‘risk’ proper ... is so far different from an unmeasurable one that it is not in effect an uncertainty at all.”

— *Risk, Uncertainty, and Profit* (1921), 20

Relevance for Energy Policy

Most “risk” frameworks in energy planning capture only the measurable. True Knightian uncertainty (e.g. political reversals, technology breakthroughs, geopolitical ruptures) sits outside models.



John M. Keynes
(1883–1946)

Irreducible Uncertainty

“About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know.”

— *The General Theory of Employment* (1937, QJE)

Relevance for Energy Policy

Some risks can be priced; the decisive ones – wars, ruptures, reversals – cannot. Good policy plans for what it cannot calculate.



**Avinash Dixit &
Robert Pindyck**

Irreversibility and Value of Waiting

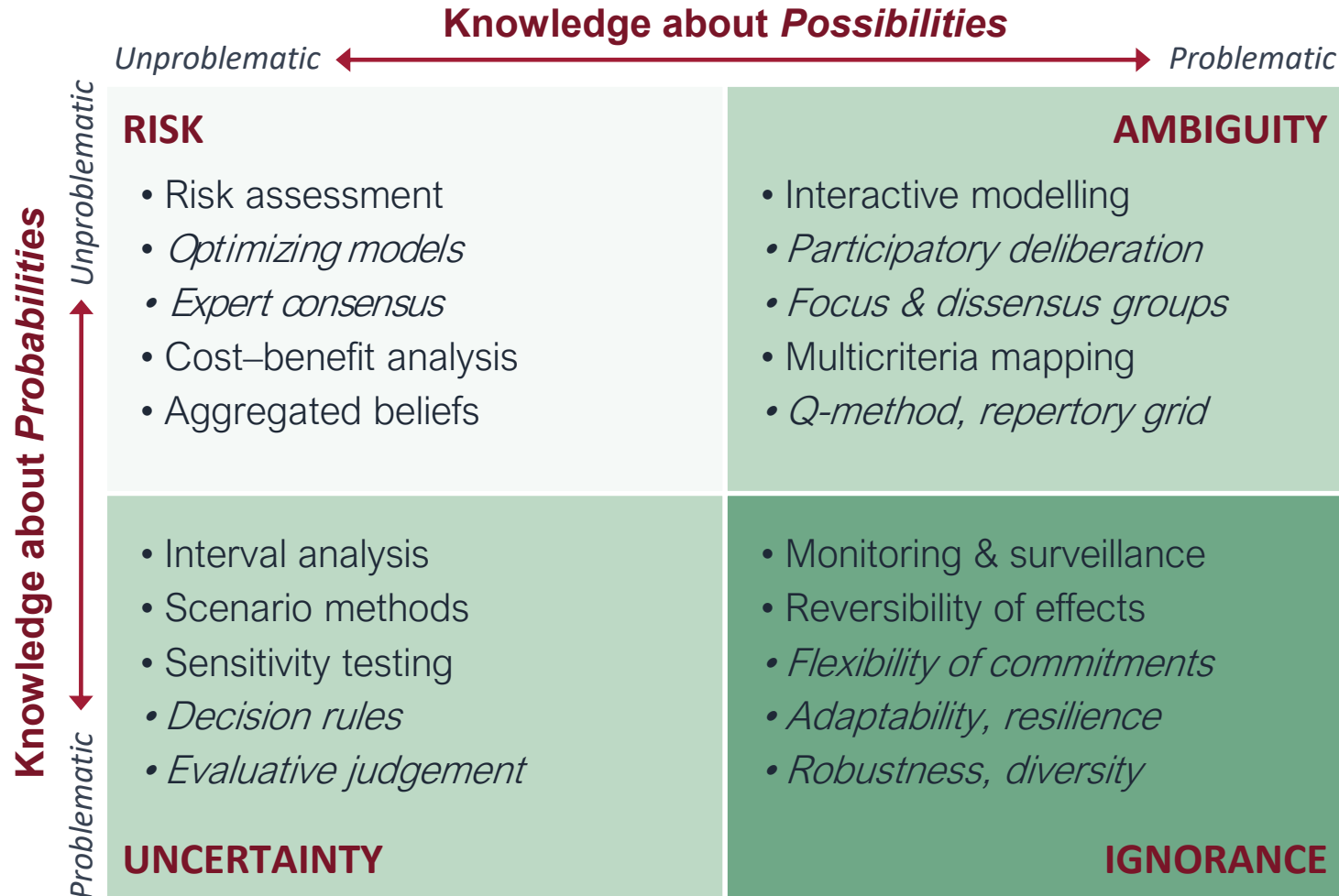
“The ability to delay an irreversible investment expenditure can profoundly affect the decision to invest ... The value of a unit of capital must exceed the purchase and installation cost by an amount equal to the value of keeping the investment option alive.”

— *Investment Under Uncertainty* (1994), 6-7

Relevance for Energy Policy

Energy infrastructure is overwhelmingly irreversible. Under uncertainty, the option to wait has real economic value and raises hurdle rates well above textbook NPV.

Designing Regional Policies for Durability



* Italics denote qualitative methods

- You cannot forecast your way to security: the **decisive unknowns** sit outside any model. As Keynes put it, “better to be vaguely right than precisely wrong.”
- **Preserve optionality and diversity:** no single technology, supplier or fuel should be a single point of failure.
- **Mobilise markets, multiply public capital:** deploy public funds where they **multiply** private investment rather than **substitute** for it.
- **Anchor in institutions that outlast cycles:** regional bodies, universities, and long-horizon mandates carry policy across electoral swings.

Source: Andrew C. Stirling (2010), [Keep it complex](#), Nature (2010)



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