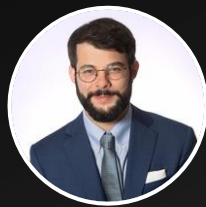




Innovating for Uncertainty:

How Innovation Teams Can Retool Their Approaches
to Help Their Corporations Manage Volatility



Anthony Schiavo
Senior Director and Principal Analyst

Agenda

01 | Why innovation teams need to respond to risk

02 | Forecasting risks beyond technology

03 | Building a risk-responsive innovation ecosystem

Risk has become a key concern in the 2020s

Chemicals companies in the pandemic decade

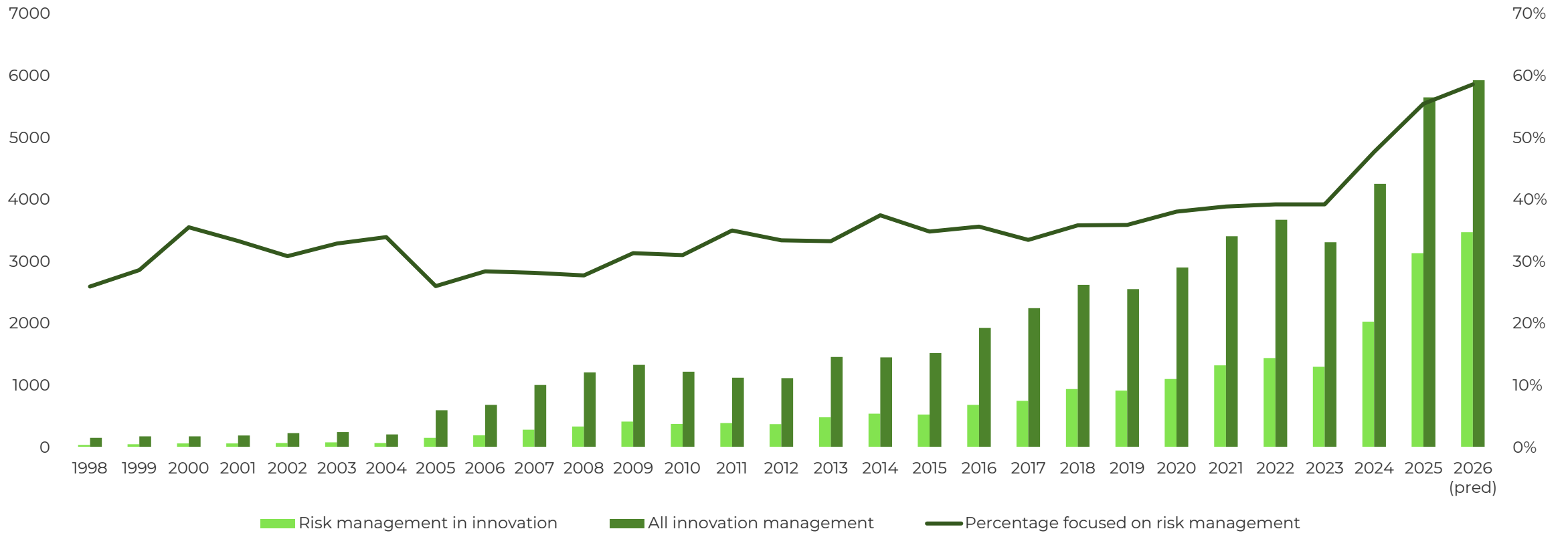
Topline growth: improved from 4% to 7%

EBIDTA growth: crushed from 2.5% to 0%

EBIDTA volatility: increased 15 percentage points

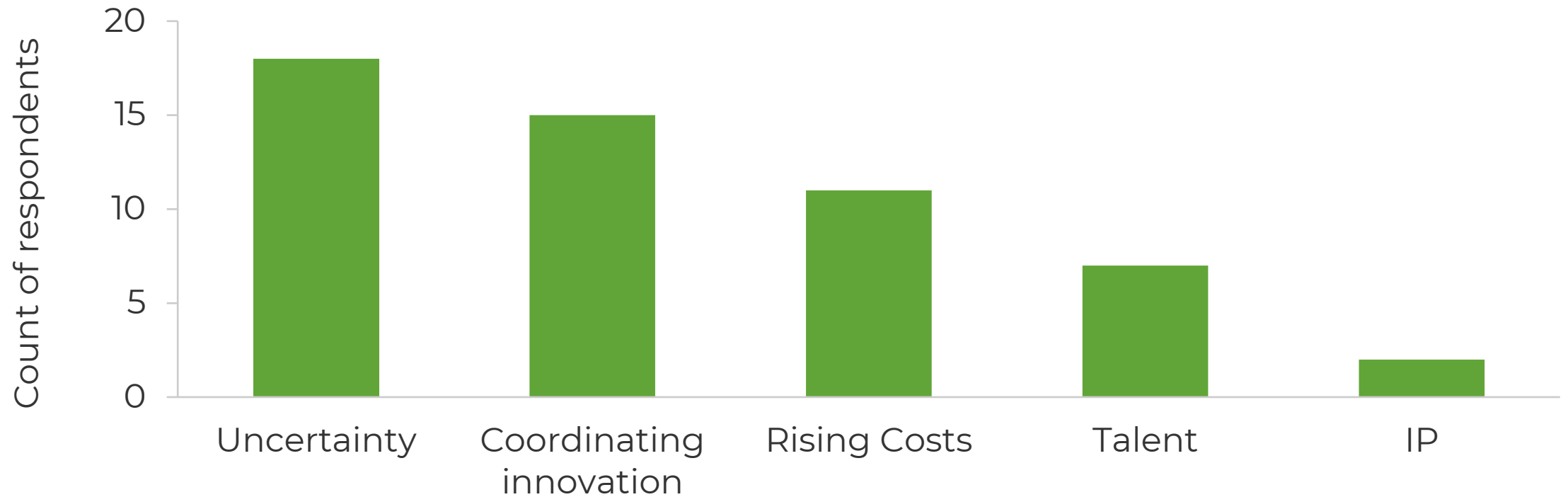
Innovation leaders' attention is turning to risk

Innovation Management Research (Publications)



Innovation survey respondents confirm this

What Do You See as Your Main Challenges Innovating Currently?



Not all risks are equal

Quantifiable



Financial risk

- Interest rates
- Capex
- Raw material costs
- Market size
- Product price

- Liability
- External costs



Technology risk

- Yield
- Specifications
- Capex
- Supply chain
- R&D costs

- Emissions cost
- Sunk costs



Legal & regulatory risk

- Regulation
- Access



Environmental risk

- Pollution
- Resilience

Not quantifiable



Societal risk

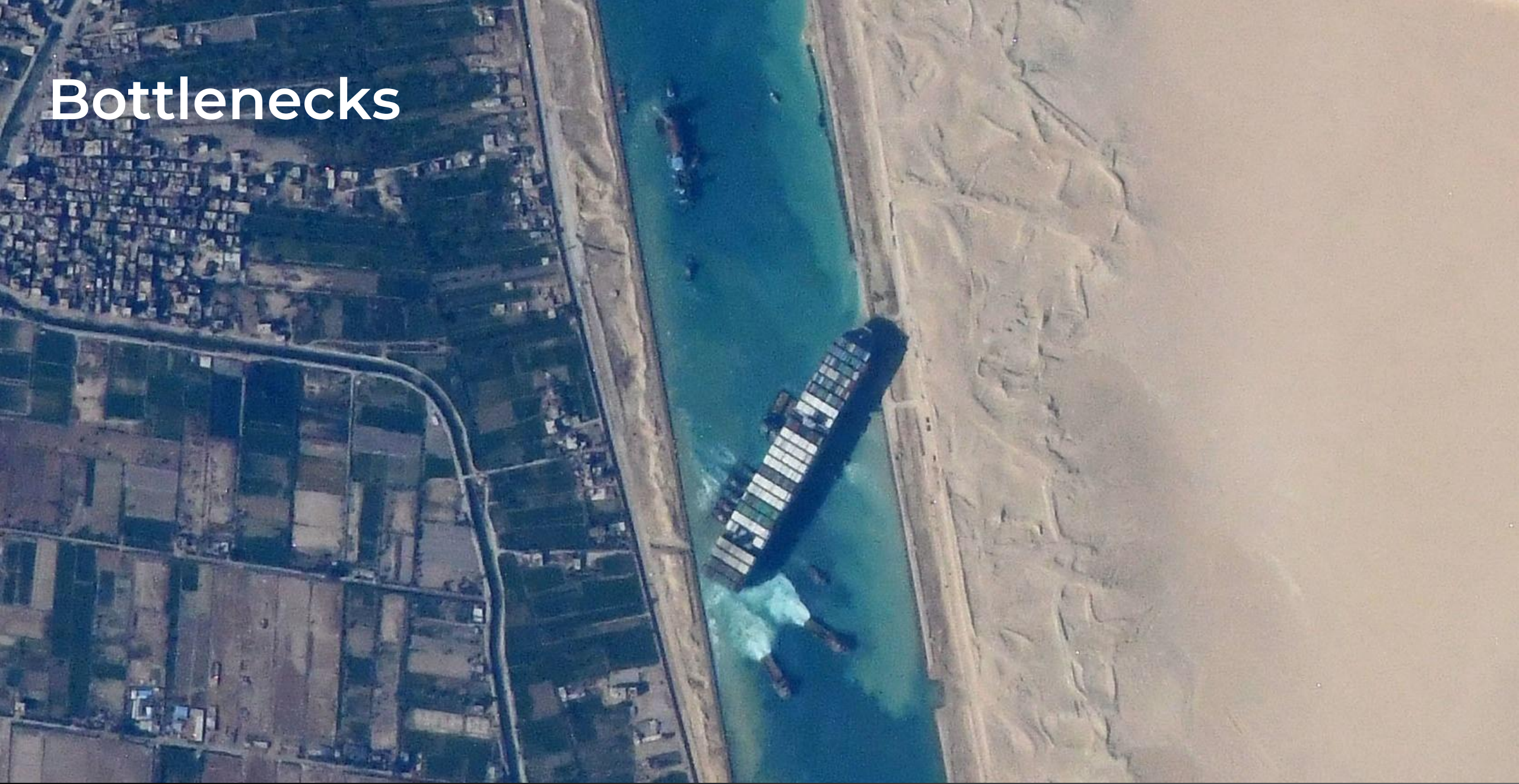
- Backlash
- Unintended consequences
- Movements



Reputational risk

- Credibility
- Spillover
- License to operate
- Partners

Bottlenecks



Bureaucrats



Backlash





**Not quantifiable does not mean not
forecastable**

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Innovation teams need to forecast these risks

Techno-economic

Regulatory

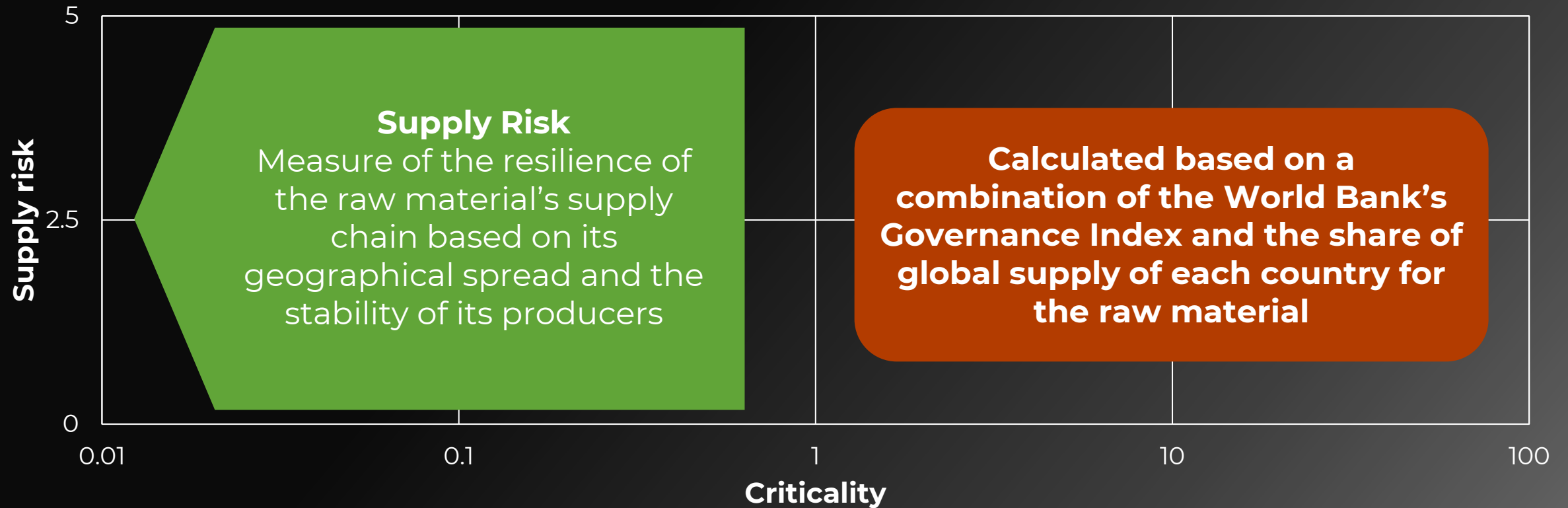
Social



**Forecasting
bottlenecks**

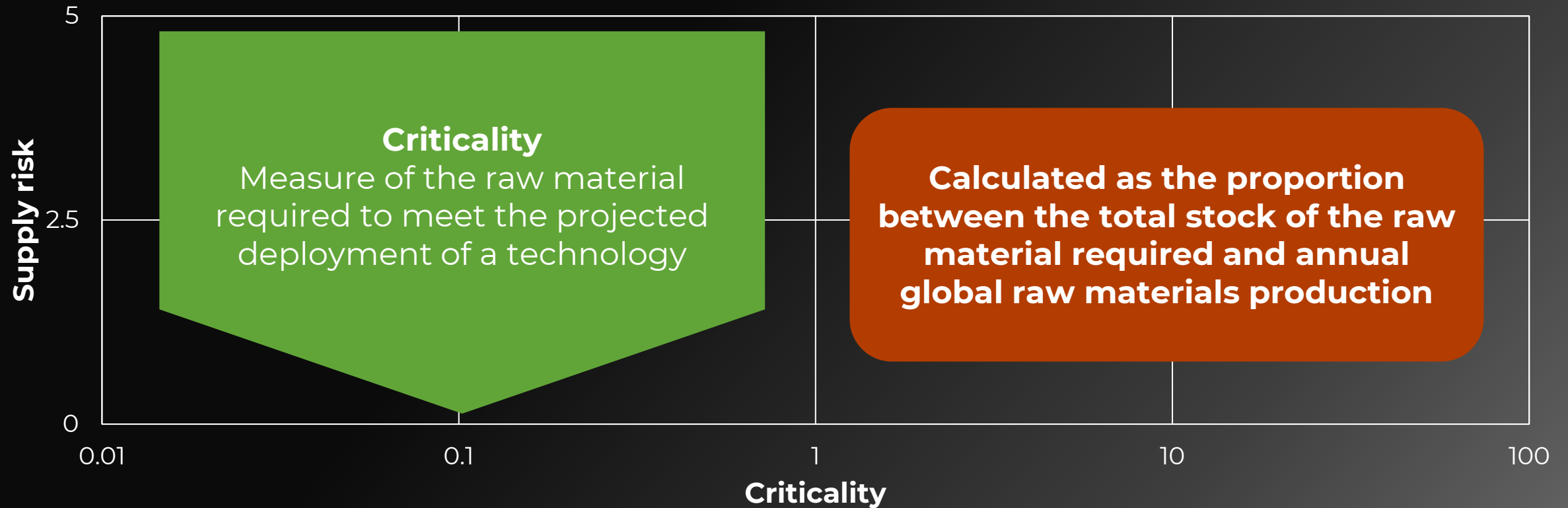
Lux Raw Materials Criticality Framework

Raw Materials Criticality Framework



Raw Materials Criticality Framework

Raw Materials Criticality Framework



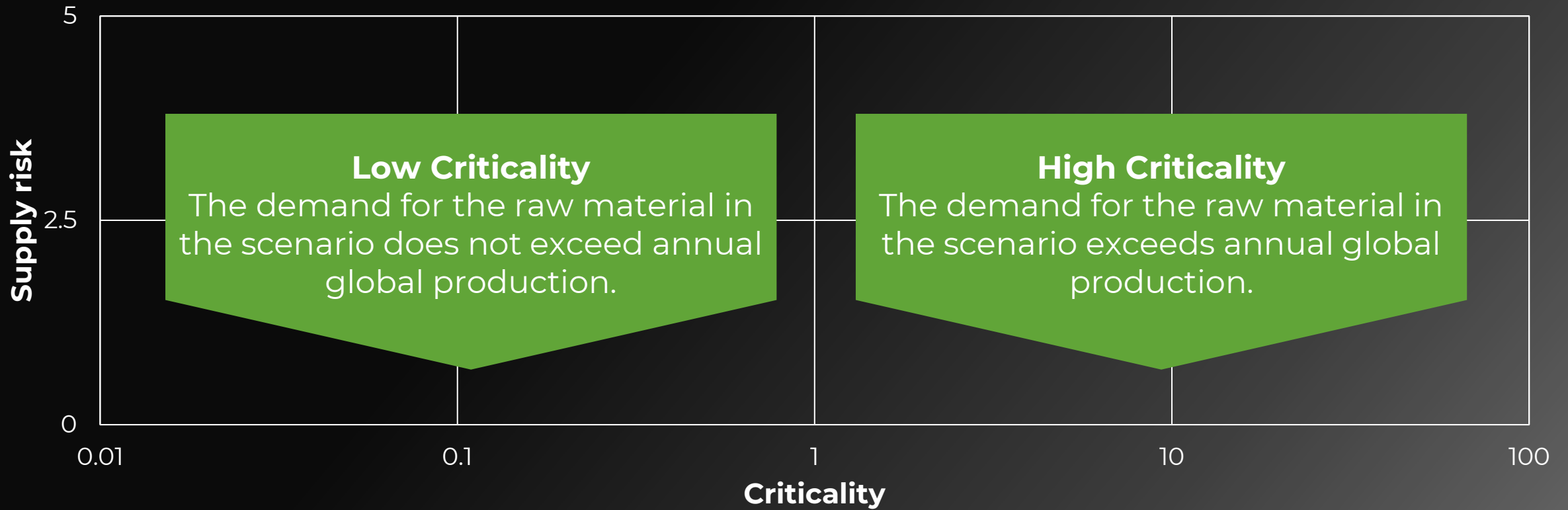
What does the framework tell us?

Raw Materials Criticality Framework



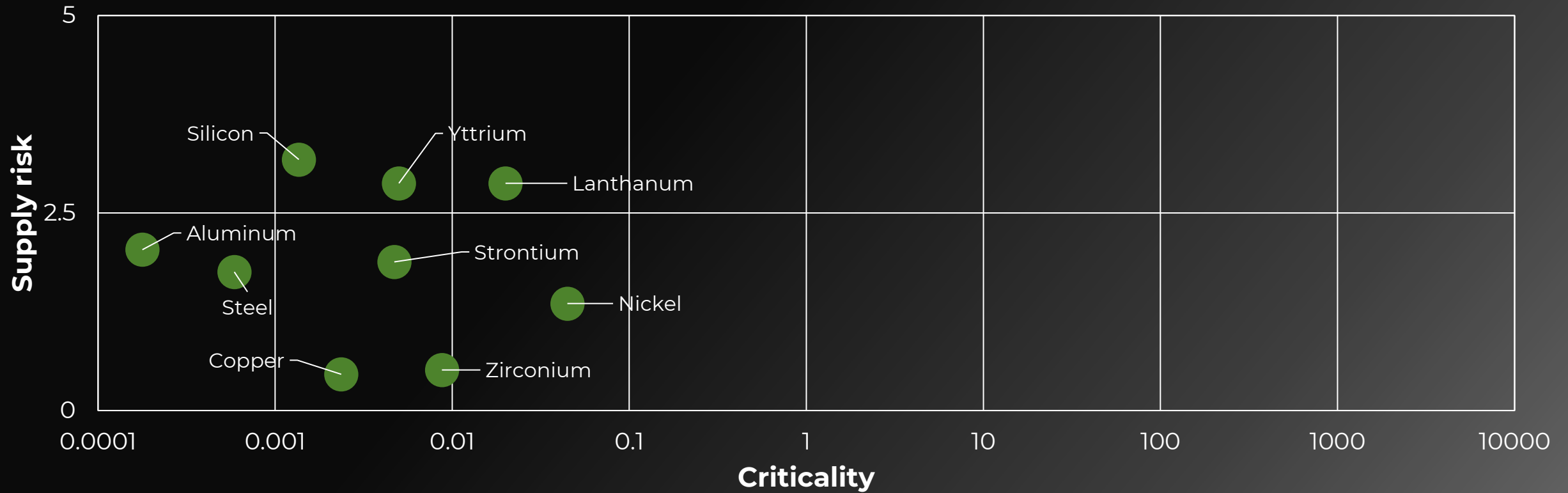
What does the framework tell us?

Raw Materials Criticality Framework



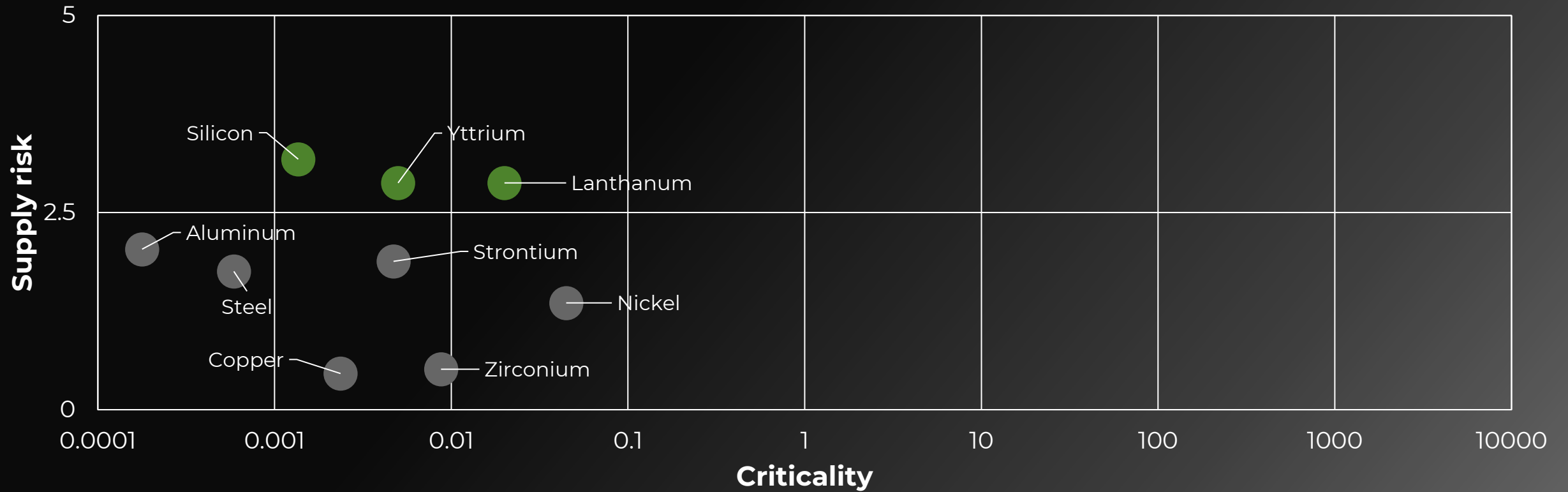
Volatility: Rare earths

Raw Materials Criticality Framework: Solid Oxide Electrolyzers



Volatility: Rare earths

Raw Materials Criticality Framework: Solid Oxide Electrolyzers



Novel sources

Support innovations that supply critical materials from waste streams and unexpected places



Industrial byproducts



Deep-sea mining



Phytomining



Innovation teams need to forecast these risks

Techno-economic



**Forecasting
bottlenecks**

Regulatory

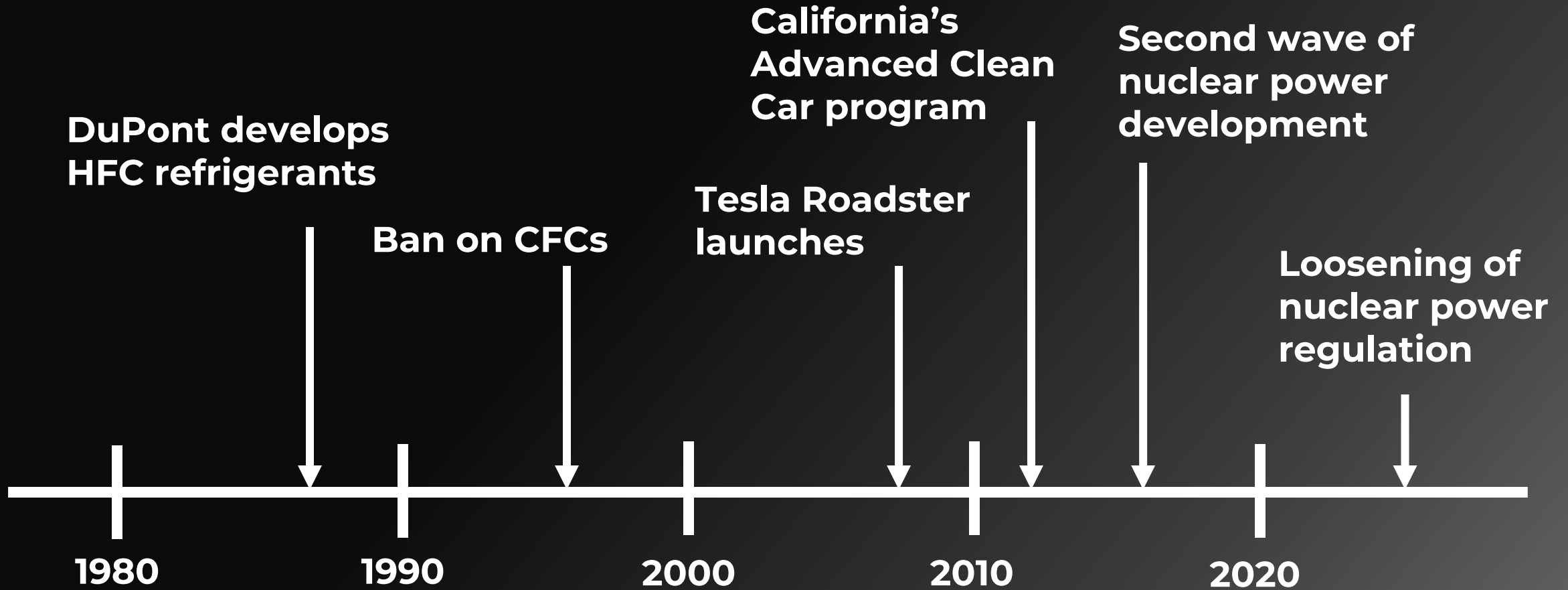


**Forecasting
bureaucrats**

Social



Technology creates regulation





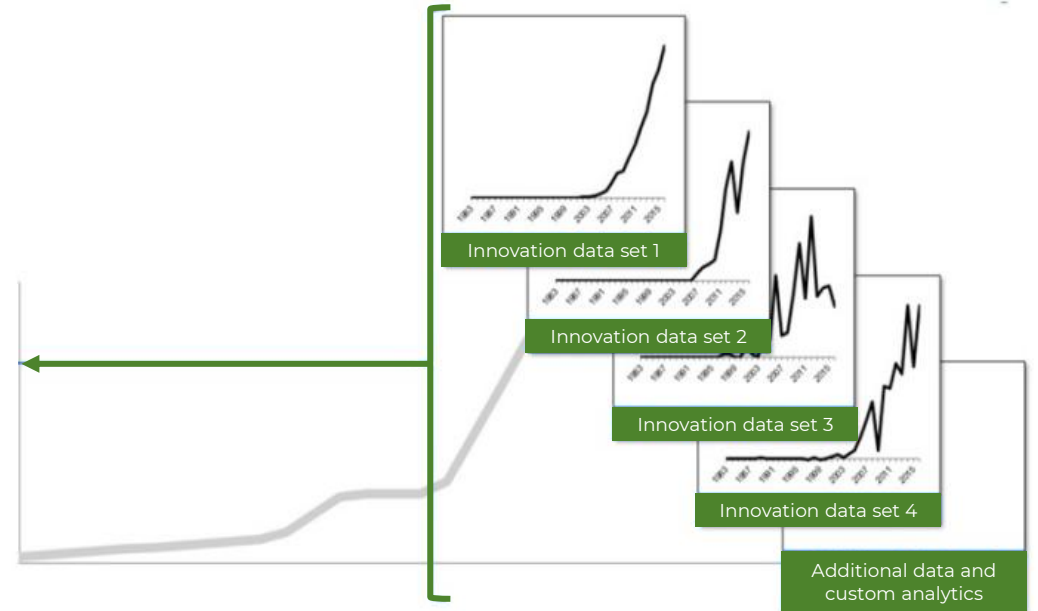
**We can forecast regulation by forecasting
technology maturity**

The Lux Tech Signal

The Tech Signal, which provides foresight into the future of innovation, is

- **Data driven** – A unitless innovation signal normalizes unique data sets.
- **Data backed** – It combines patents, academic publications, venture funding, early stage government funding, and Lux proprietary data.
- **Foresight** – It pinpoints early indicators of technology breakthroughs and bursting hype bubbles.

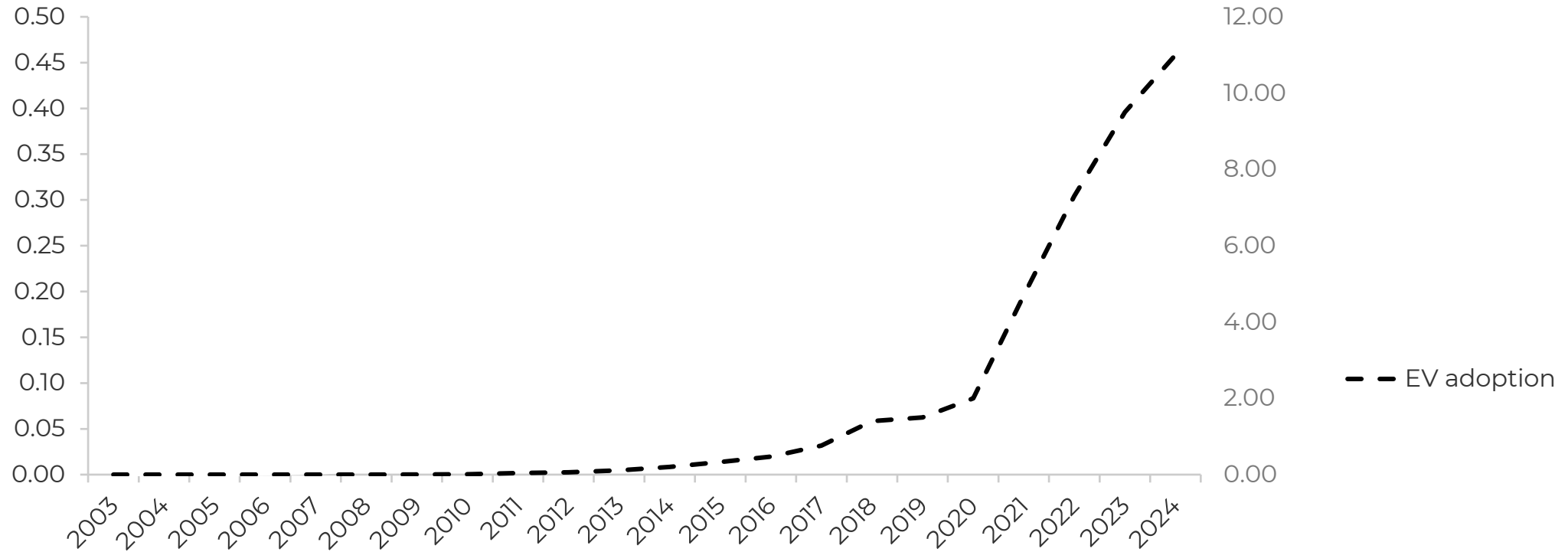
Innovation Interest
(unitless, based on multiple normalized data sets)



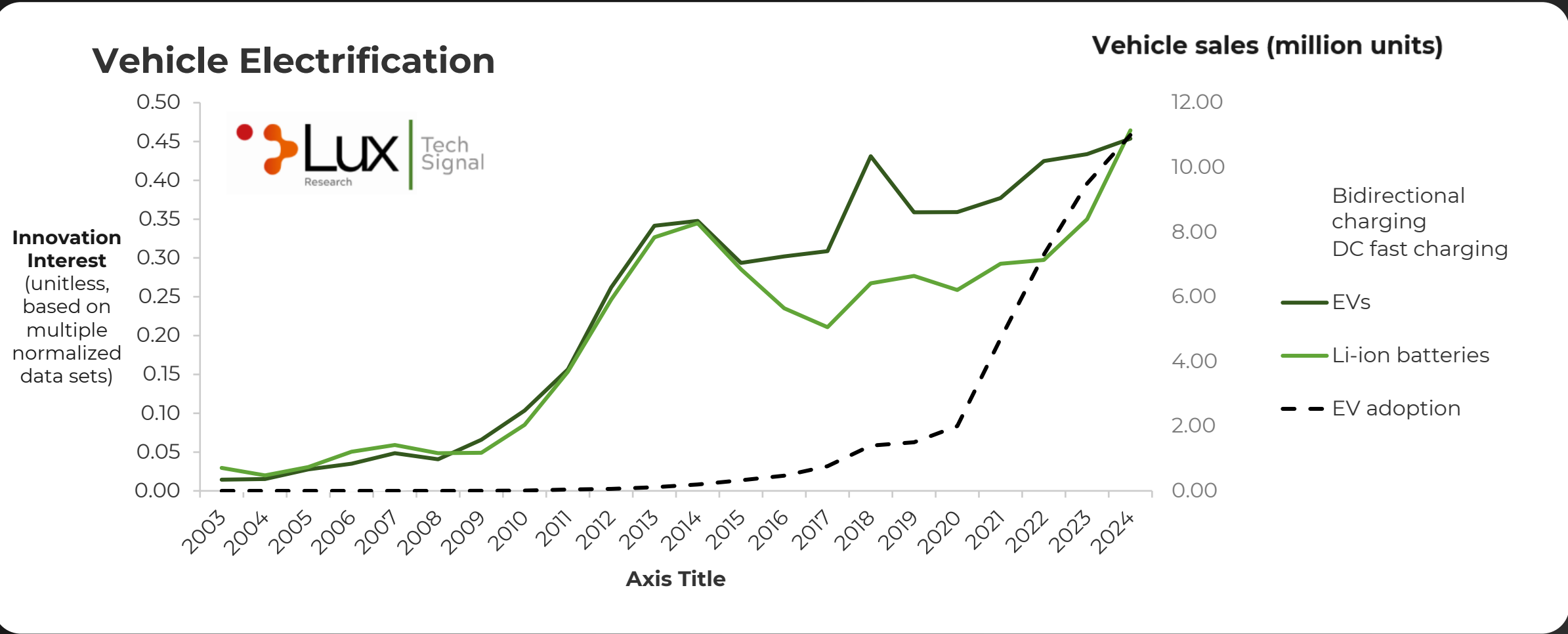
1 in 5 vehicles produced globally is now electric

Vehicle Electrification

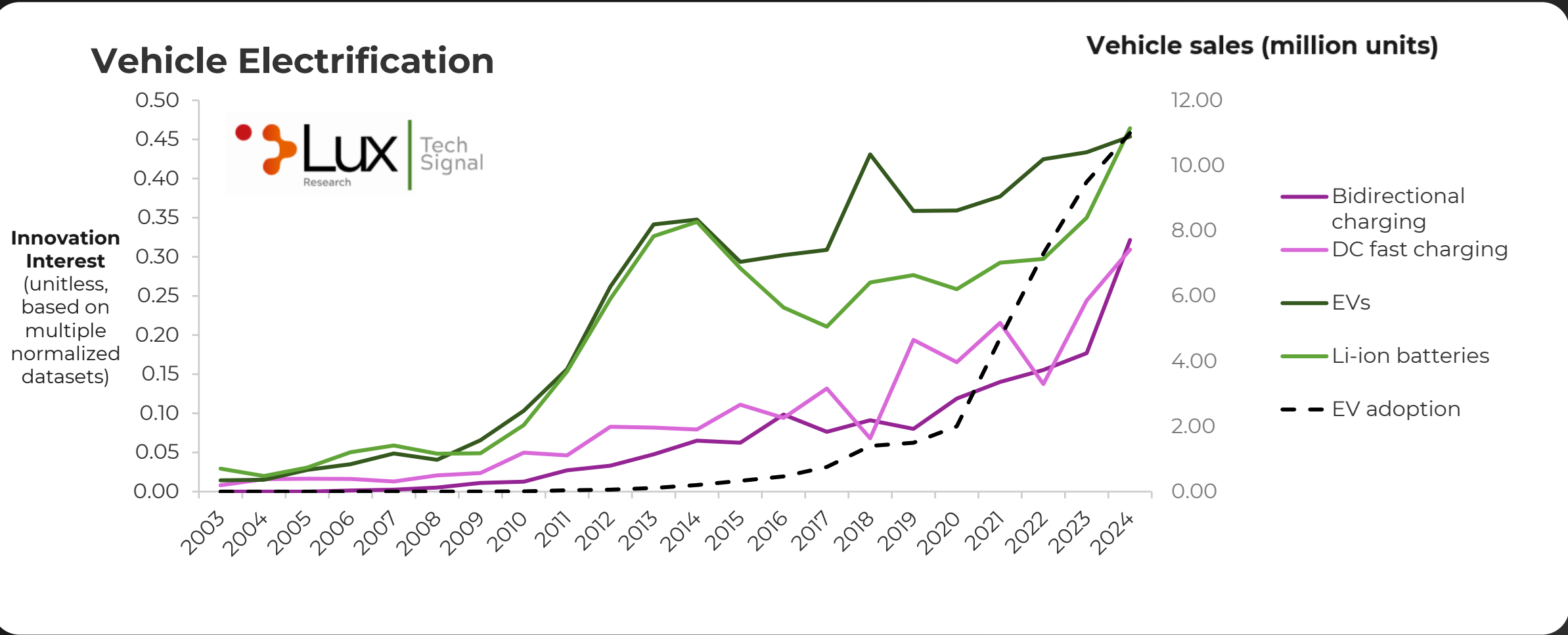
Vehicle sales (million units)



The tech signal for EV accelerated as adoption started



Supporting infrastructure is now on the rise, as EV sales grow



Load management



Microgrids



Vehicle to grid



Innovation teams need to forecast these risks

Techno-economic



**Forecasting
bottlenecks**

Regulatory



**Forecasting
bureaucrats**

Social



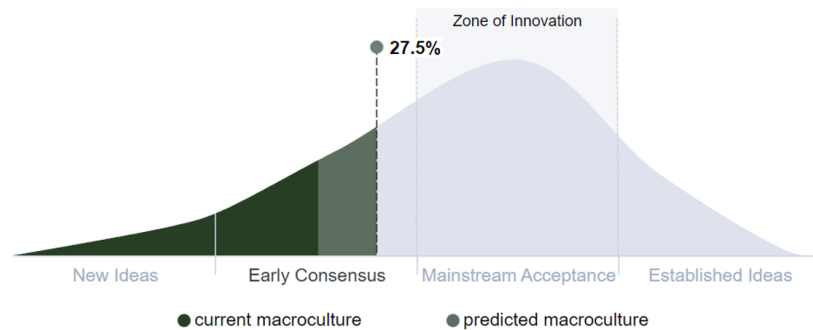
**Forecasting
backlash**

Understanding consensus

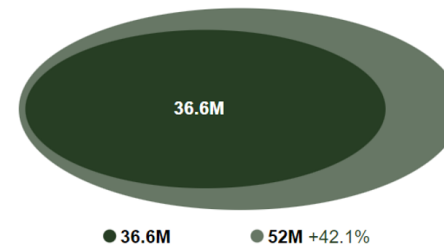
Maturity

Macroculture: *gut health*

Maturity Curve
19.3%
current



Population



This topic scores 19.3% on the maturity curve and is expected to expand to 27.5% in 12-24 months.

This culture is currently relevant to 36.6M people and is expected to grow by 42.1% in 12-24 months.

Maturity Curve

A measure of consensus around a topic. In this example, if you ask 100 people to define “gut health,” 19 would use similar language to describe it.

Population

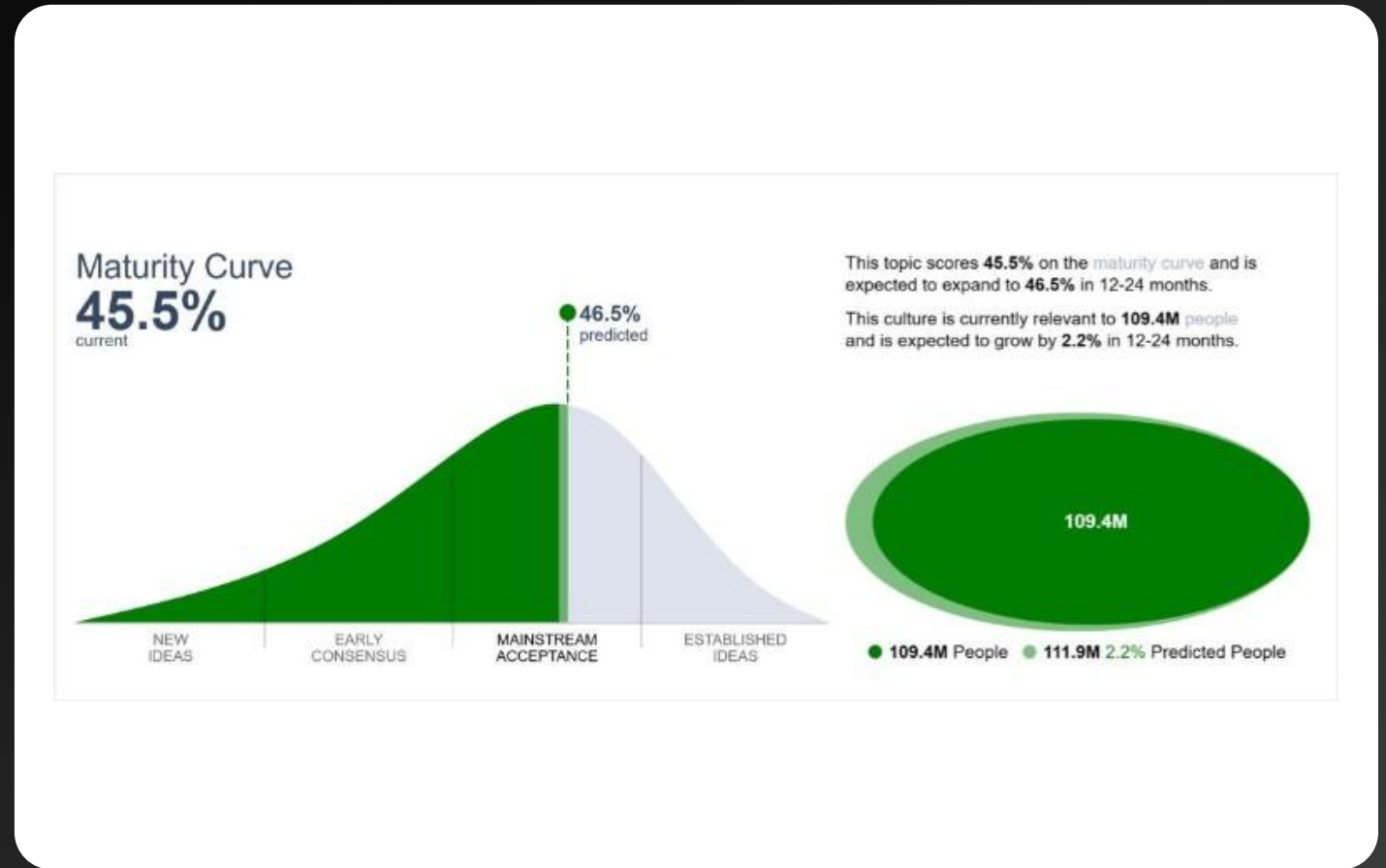
The maximum number of people that a topic is relevant to. Provides current state (and future state when relevant).

LUX TAKE

The further right a topic sits on the maturity curve, the more consistently it is understood by consumers to mean something(s) to them in their lives. The maturity curve & population size function as important indicators of timing and level of opportunity.

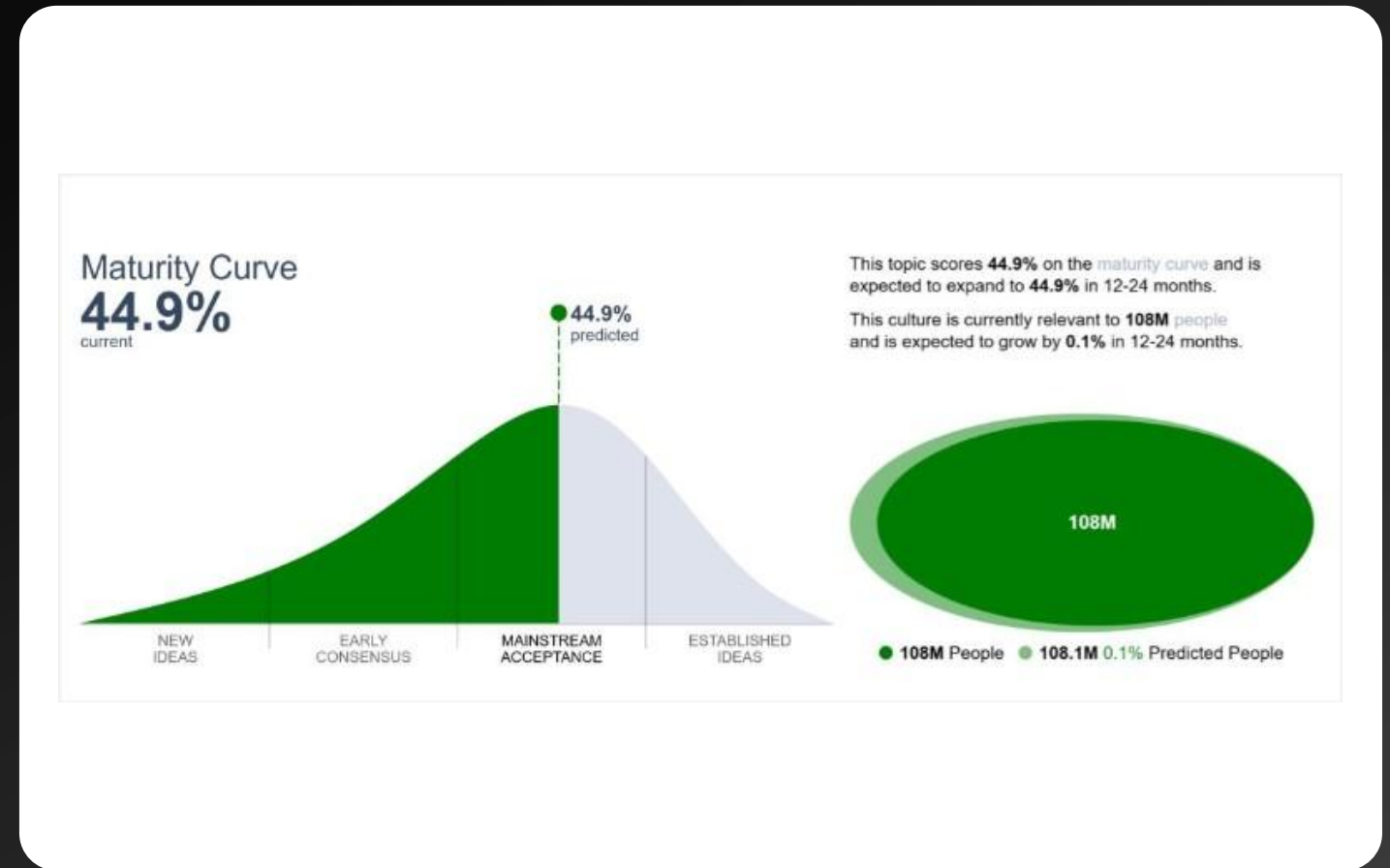
The rolling PFAS crisis

- Food



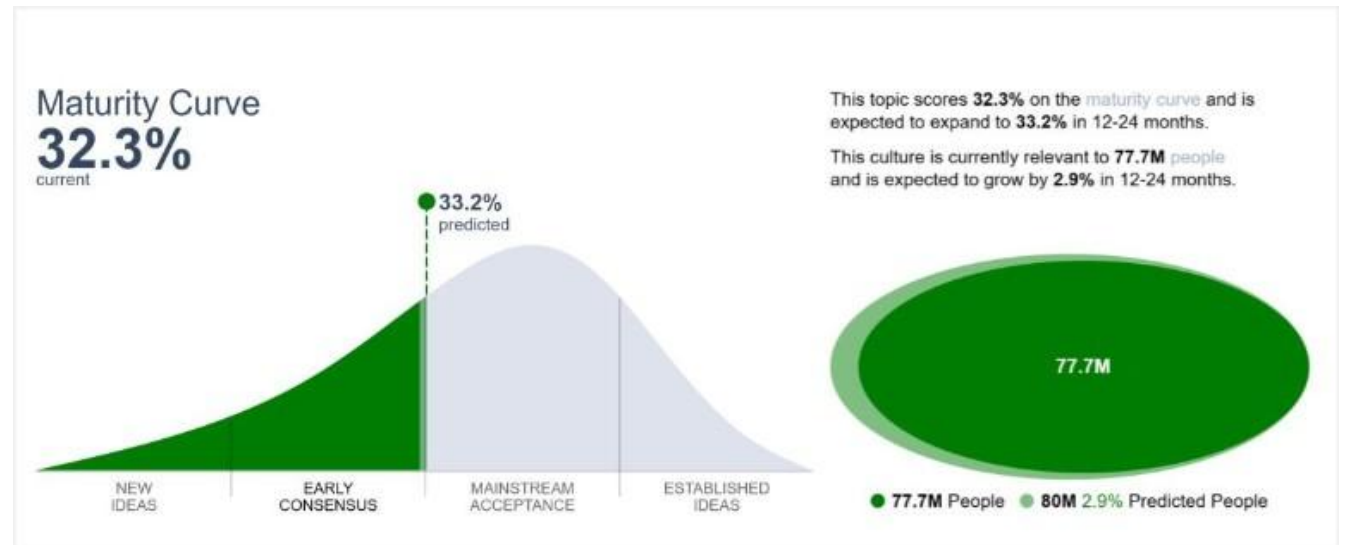
The rolling PFAS crisis

- Food
- Cooking and household goods



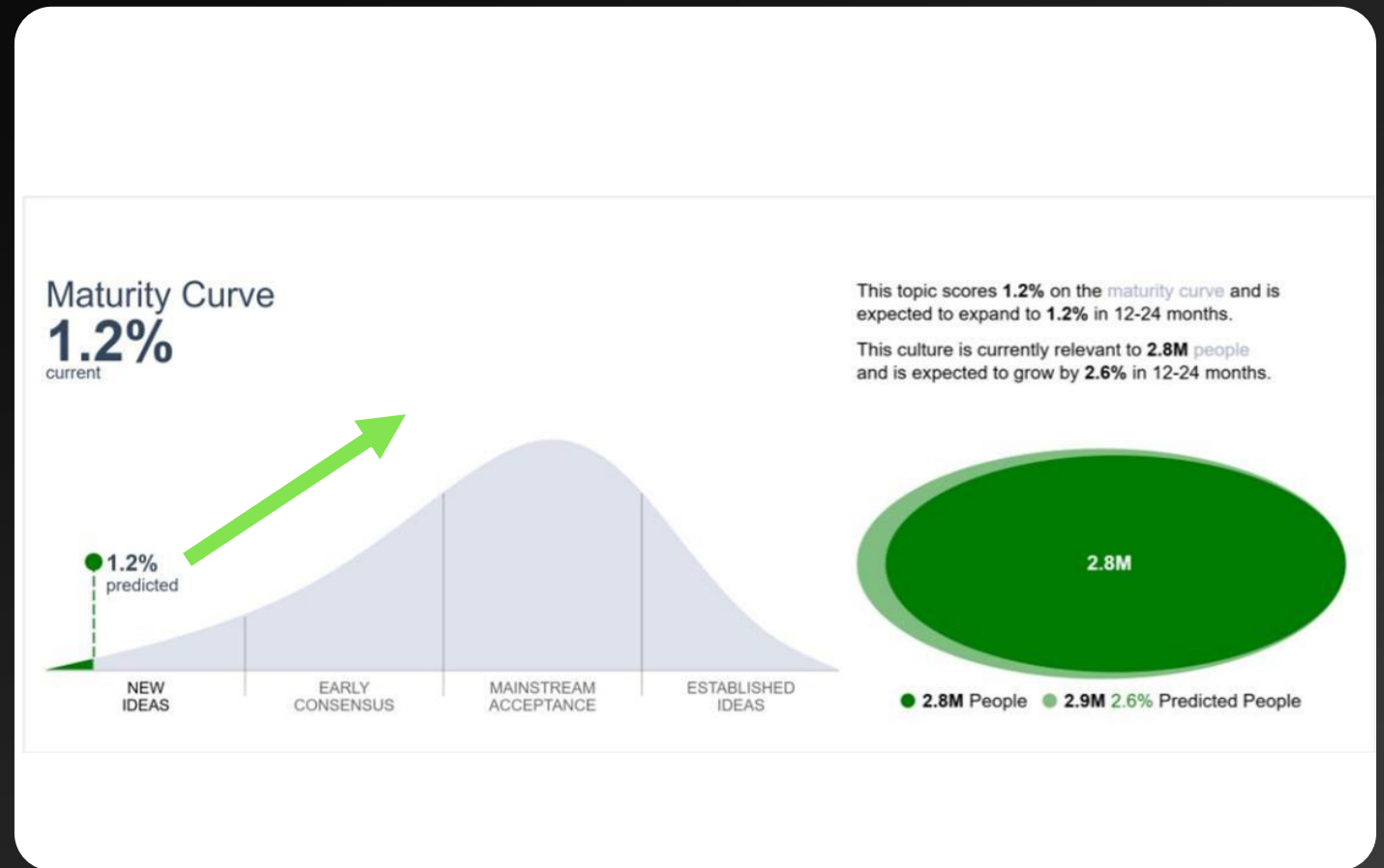
The rolling PFAS crisis

- Food
- Cooking and household goods
- Cleaning products



The rolling PFAS crisis

- Food
- Cooking and household goods
- Cleaning products
- The health contradiction of sports equipment



Biomaterials



Surface treatments



Waxes and lubricants





If you can predict these risks, they will become opportunities rather than threats

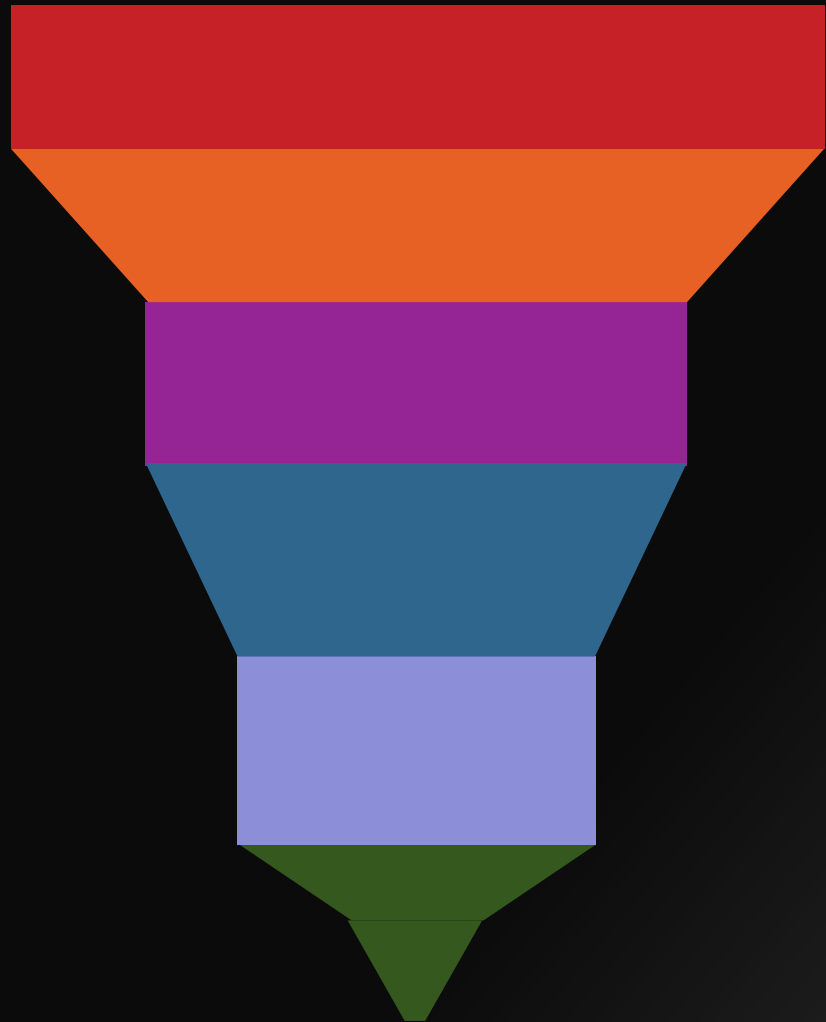
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Innovation processes are growth oriented



STAGE 1

Insight

Turn risk into growth

STAGE 2

Ideation

STAGE 3

Investigation

Develop new business models

STAGE 4

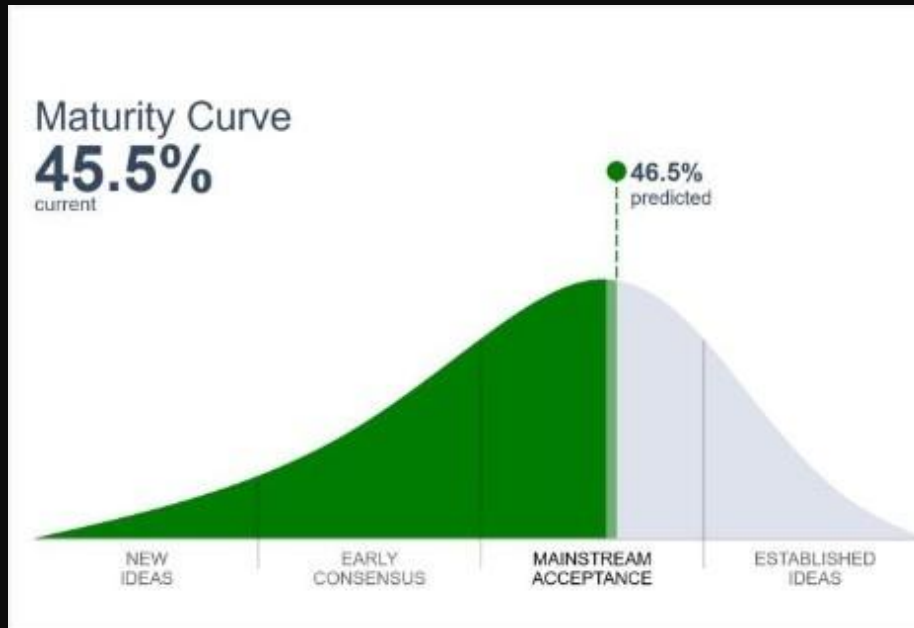
Investment (pilot)

STAGE 5

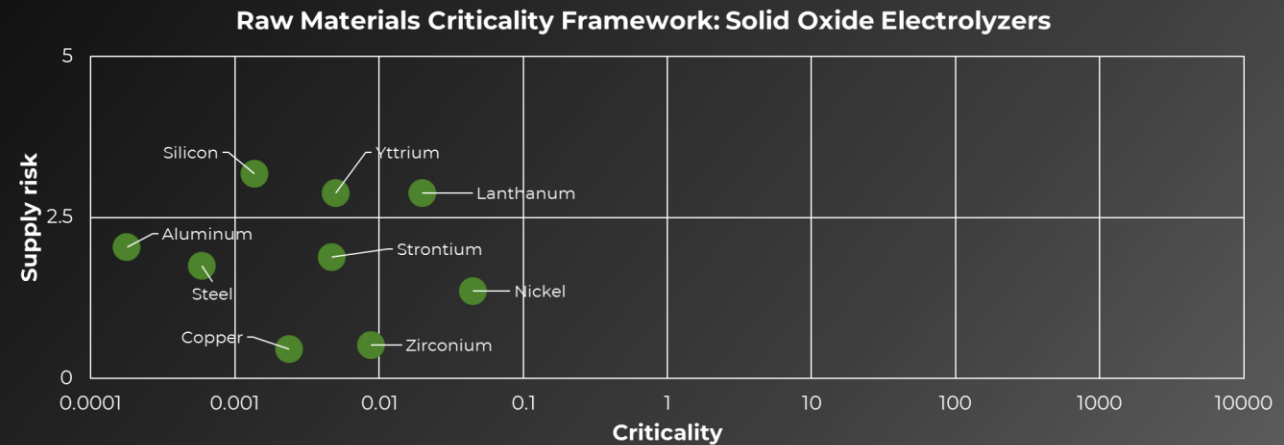
Implementation (launch)

Turning risk into growth means pitching the right target

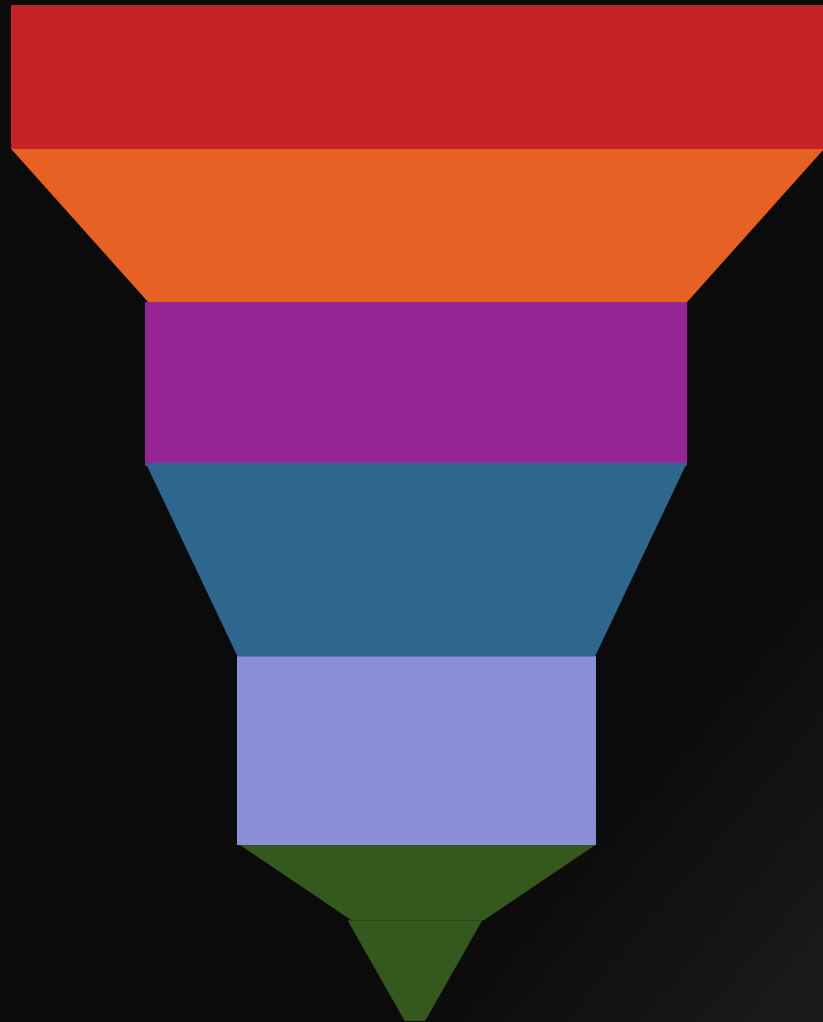
PFAS



Rare earths



Innovation processes are growth oriented



STAGE 1

Insight

Turn risk into growth

STAGE 2

Ideation

STAGE 3

Investigation

Develop new business models

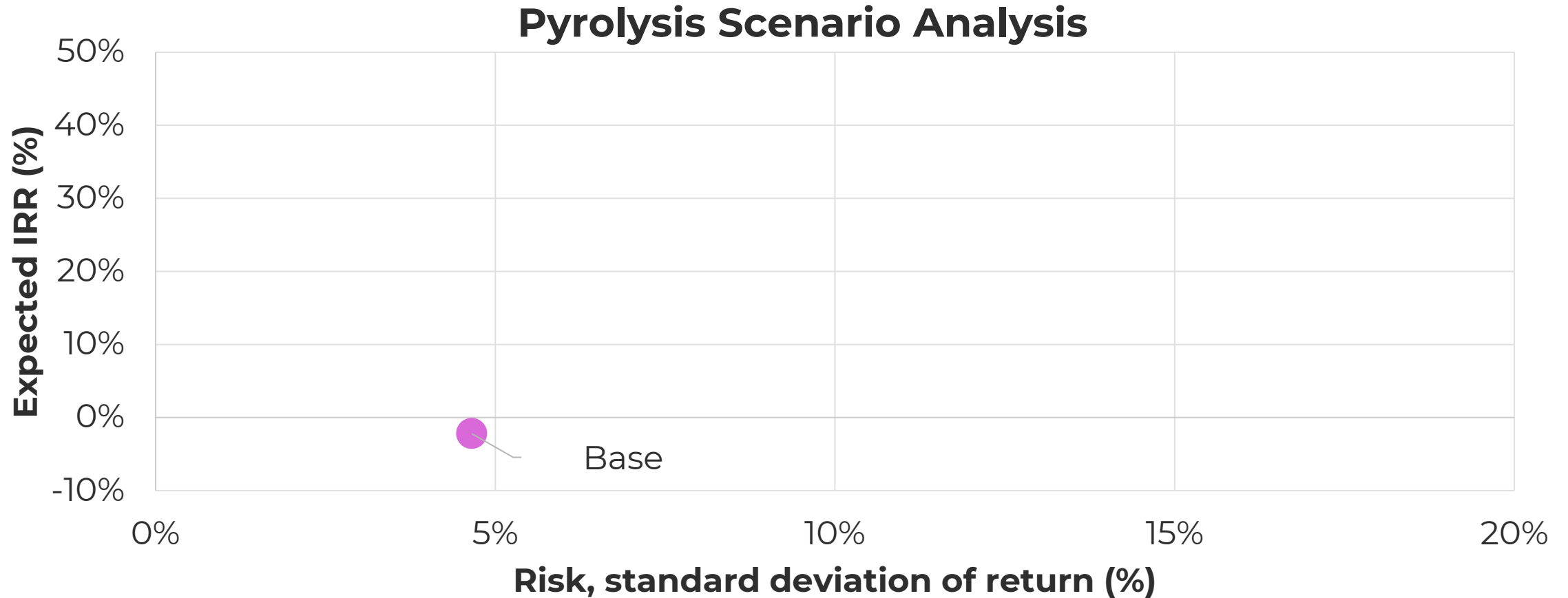
STAGE 4

Investment (pilot)

STAGE 5

Implementation
(launch)

Pyrolysis has an expected negative return



There could be more than pure financial returns



Asian refineries, petchem firms cut runs as Iran war disrupts supplies.



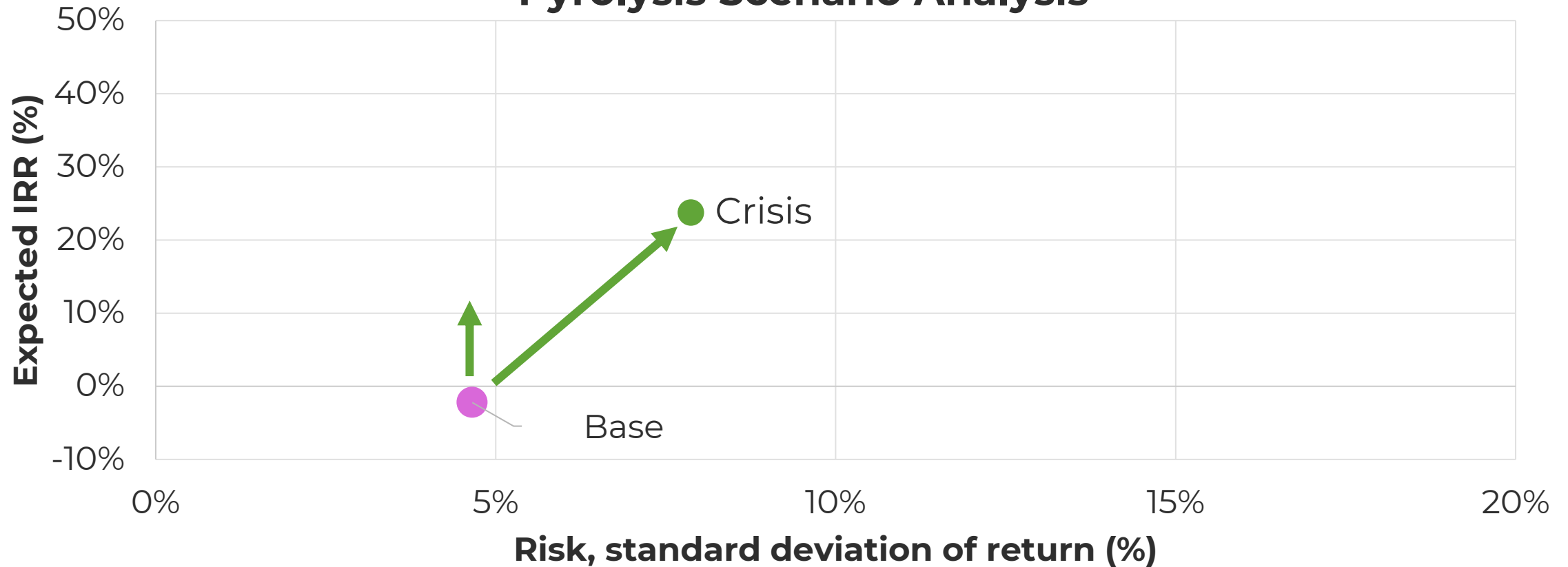
Philippines declares energy emergency over Middle East conflict risks.



Southeast Asia shuts offices, limits travel as oil crisis deepens.

New business models can raise returns in the base case

Pyrolysis Scenario Analysis



Key takeaways

1

Innovation practices need to change to enable risk management.

These approaches derive from a different era when growth was paramount.

2

Intangible risks might not be quantifiable, but they are forecastable.

Innovation teams need new skills and approaches to manage uncertainty and select the right technologies.

3

Startups need to adapt to a system that doesn't appreciate risk reduction.

There are valuable technologies for our risky world, but the innovation ecosystem will take time to adapt. Startups working today can't wait and will have to adapt themselves.



Thank You



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About Lux

Lux Research fuels innovators to not only imagine what's possible in the future but also operationalize innovation success in the near term. We deliver research and advisory services to inspire, illuminate, and ignite innovative thinking that reshapes and grows businesses. Using quality data derived from primary research, fact-based analysis, and opinions that challenge traditional thinking, our experts focus on finding truly disruptive innovations that are also realistic and make good business sense.

The “Lux Take” is trusted by innovation leaders around the world, many of whom seek our advice directly before placing a bet on a startup or partner — our clients rely on Lux insights to make decisions that generate fantastic business outcomes. We pride ourselves on taking a rigorous, scientific approach to avoid the hype and generate unique perspectives and insights that innovation leaders can't live without.

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