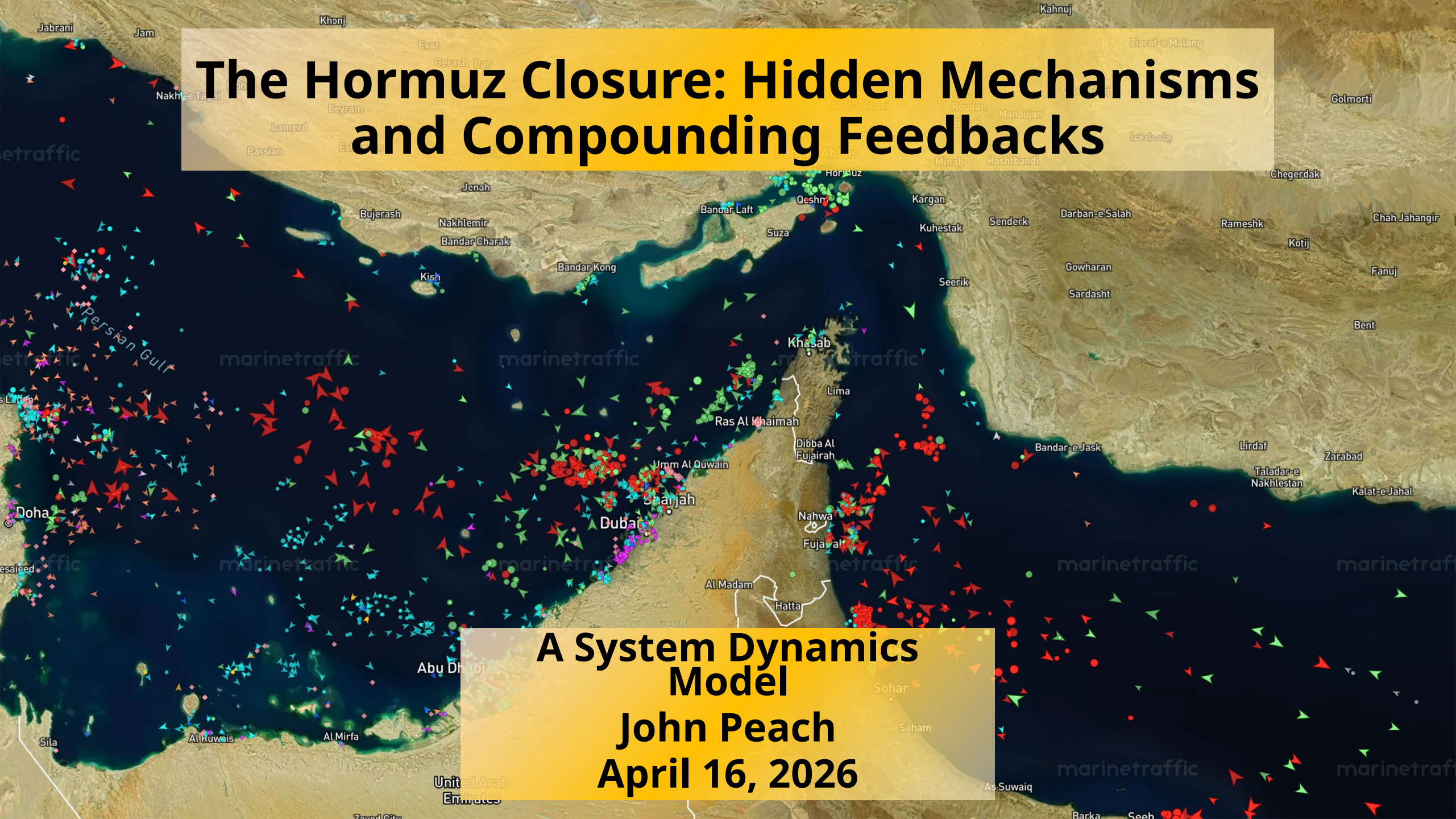

The Hormuz Closure: Hidden Mechanisms and Compounding Feedbacks

A System Dynamics Model

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The Public View

- Tankers blocked, oil prices increasing
- SPR released, shale will compensate (if they’re even aware)
- The problem is mostly “over there”
- The impacts of the Hormuz closure are disruptive but manageable

What a manageable disruption assumes

- Neoclassical economics treats oil as a fungible commodity

- Price signal → Supply response → Equilibrium restored

- Oil is 2% to 3% of global GDP, so impactful but not a cause for alarm

Food production accounts for “only” 4% of GDP, so take away all food and the economy is only slightly reduced.

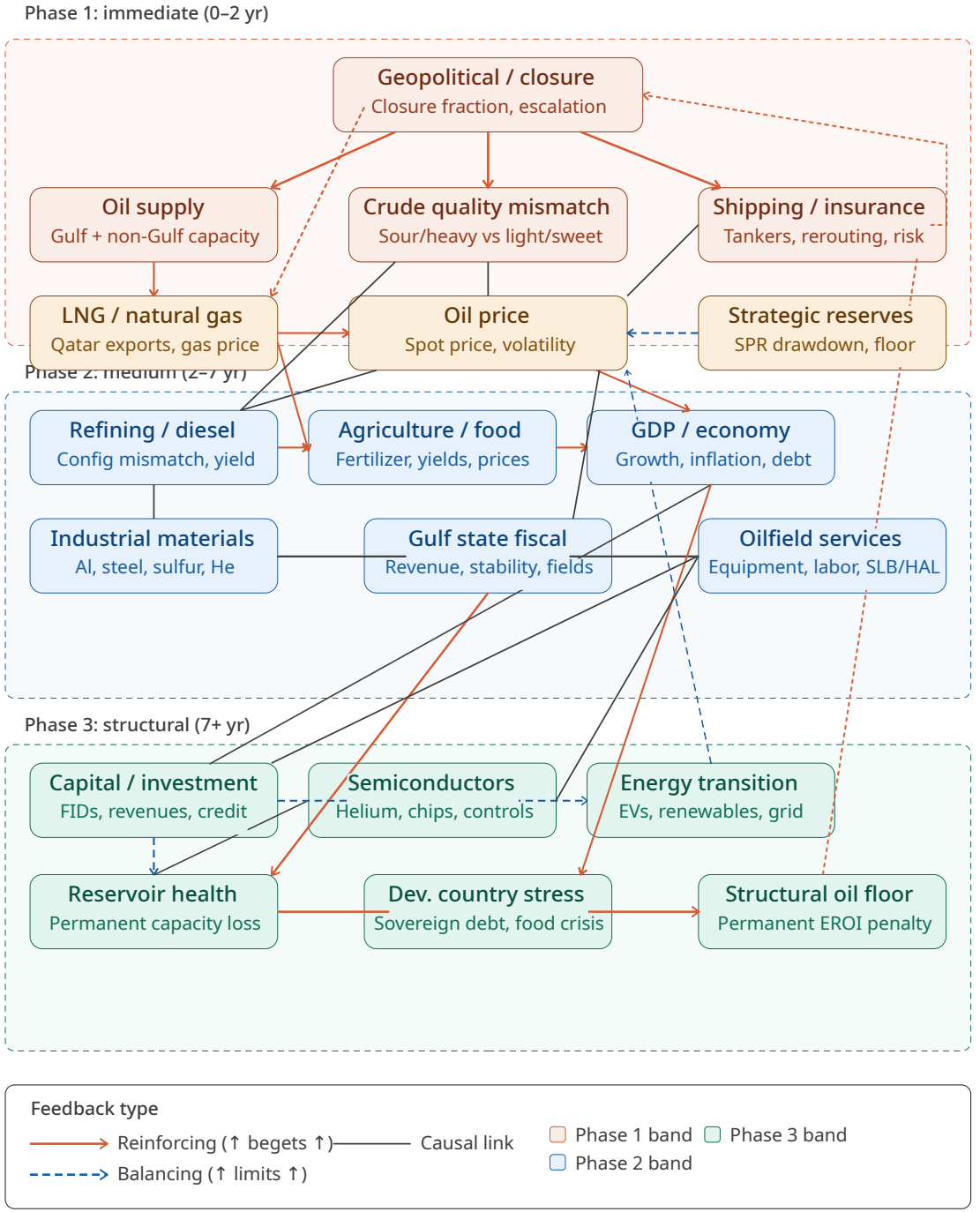
These assumptions are wrong in a physical crisis

The Actual Economy

- Complex feedback loops, not linear chains
- Time delays: investments today produce oil in 9–36 months
- Irreversibilities: some damage does not reverse when the strait reopens
- Complex non-linearities: small inputs can produce large, discontinuous outputs

The stakes and why it matters:

- **Neo-classical linear –** everything resolves in 6-12 months
- **Feedback model –** effects compound and become permanent



Crude grades matter

- Gulf crude is mostly heavy/sour.
- Asian and European refineries are specifically built for Gulf crude and can’t be easily modified to run light sweet.
- U.S. shale, Norwegian light cannot substitute.
- 50-60% of internationally traded heavy/sour crude is stranded.
- Reconfiguration could take over a decade to complete.

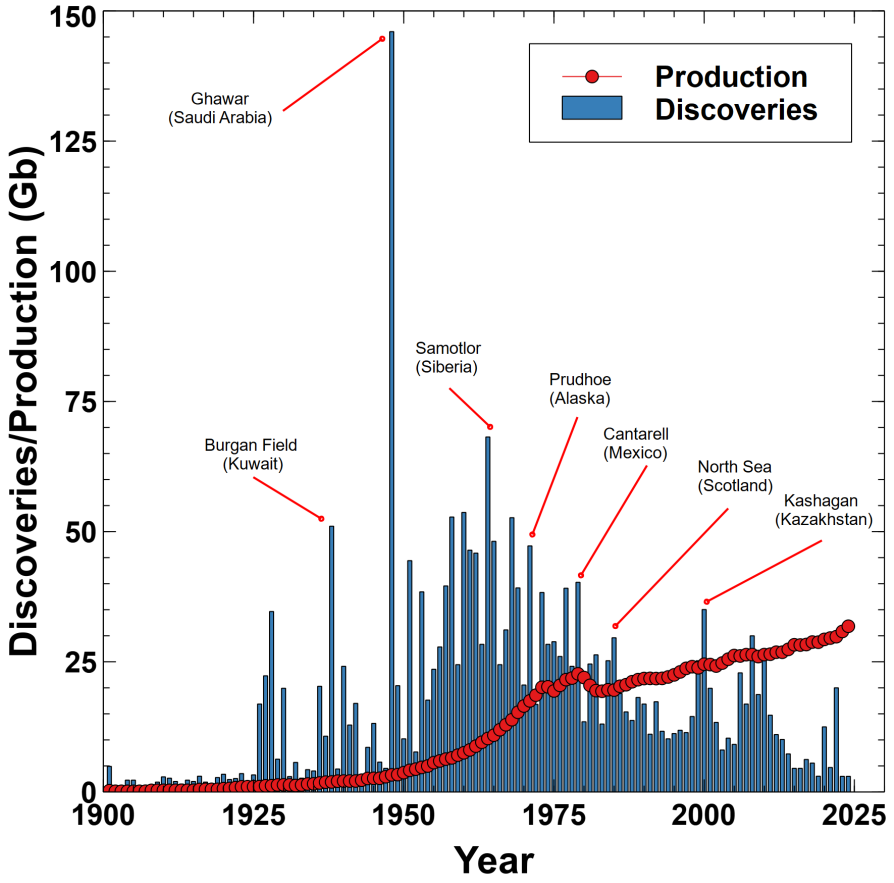
The supply gap the market calculates is not the effective supply gap.

The Diesel Problem

- Diesel is the rate limiter for the real economy.
- Heavy/sour crude yields 30-40% diesel. Light/sweet yields 20-25%.
- Every farmer, miner, and freight operator runs on diesel.
- The diesel shortage is 20-35% — not the headline oil price number.
- Other middle distillates also impact commerce:
  - Bunker fuel shortages raise cost of transoceanic shipping
  - Kerosene / jet fuel increase cost of air freight and travel

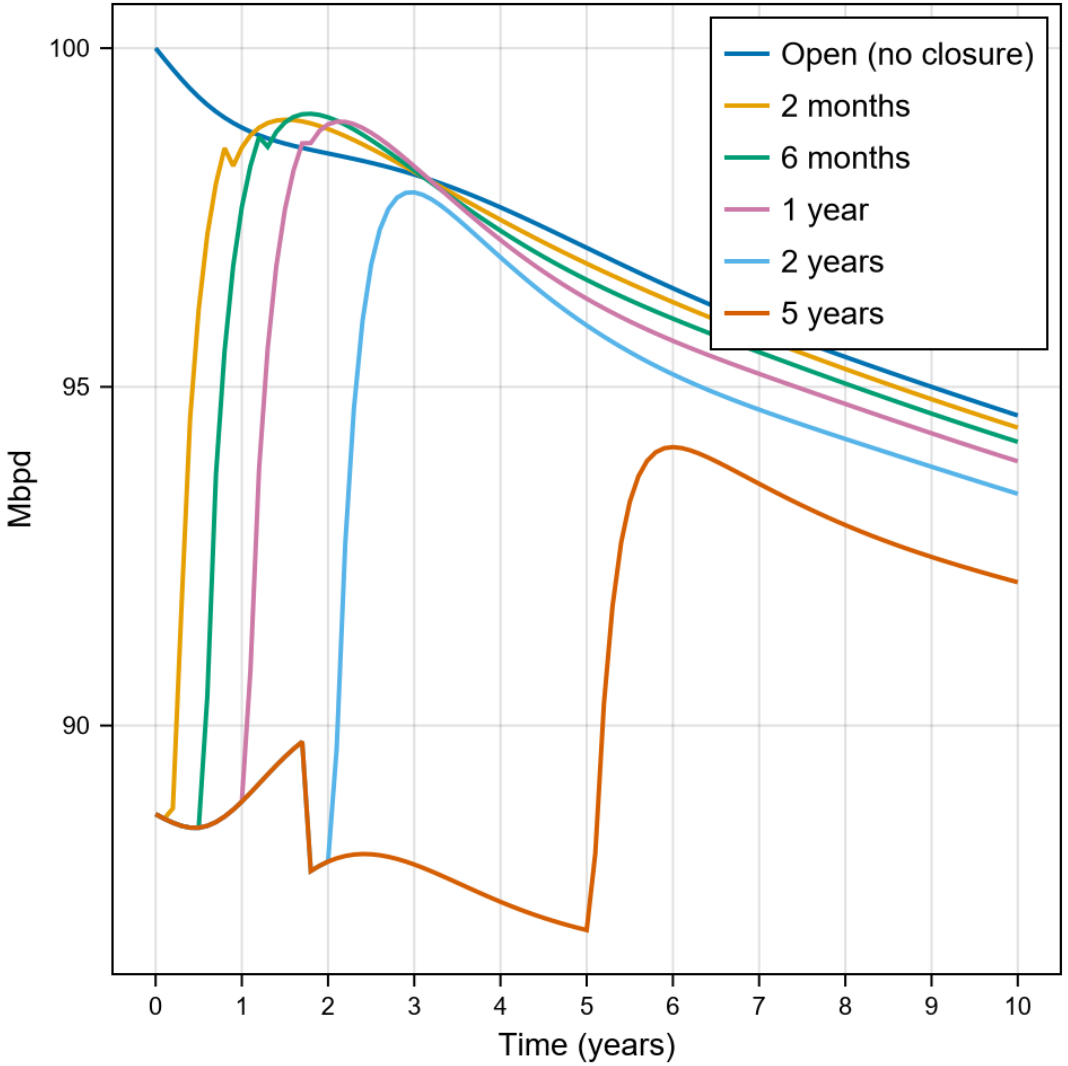
Peak Oil

- 700 Gb remaining reserves.
- 35 Gb/year gives 20 years at current rates.
- Discoveries peaked in 1964 (ex Ghawar).
- Production midpoint in 1996 – half of oil production occurred in last 30 years.
- Reserve replacement was already a problem.
- Hormuz closure accelerates the inevitable.



Oil Production by Closure Scenario

- All closure scenarios begin at ~88 Mbpd (pipeline bypass only)
- Open scenario: 100 Mbpd declining slowly from peak oil — the preexisting baseline
- SPR exhaustion visible at ~year 2 in all closure scenarios
- 5-year closure: permanently separated from others by year 10 — reservoir damage that never recovers
- No scenario returns to 100 Mbpd within 10 years

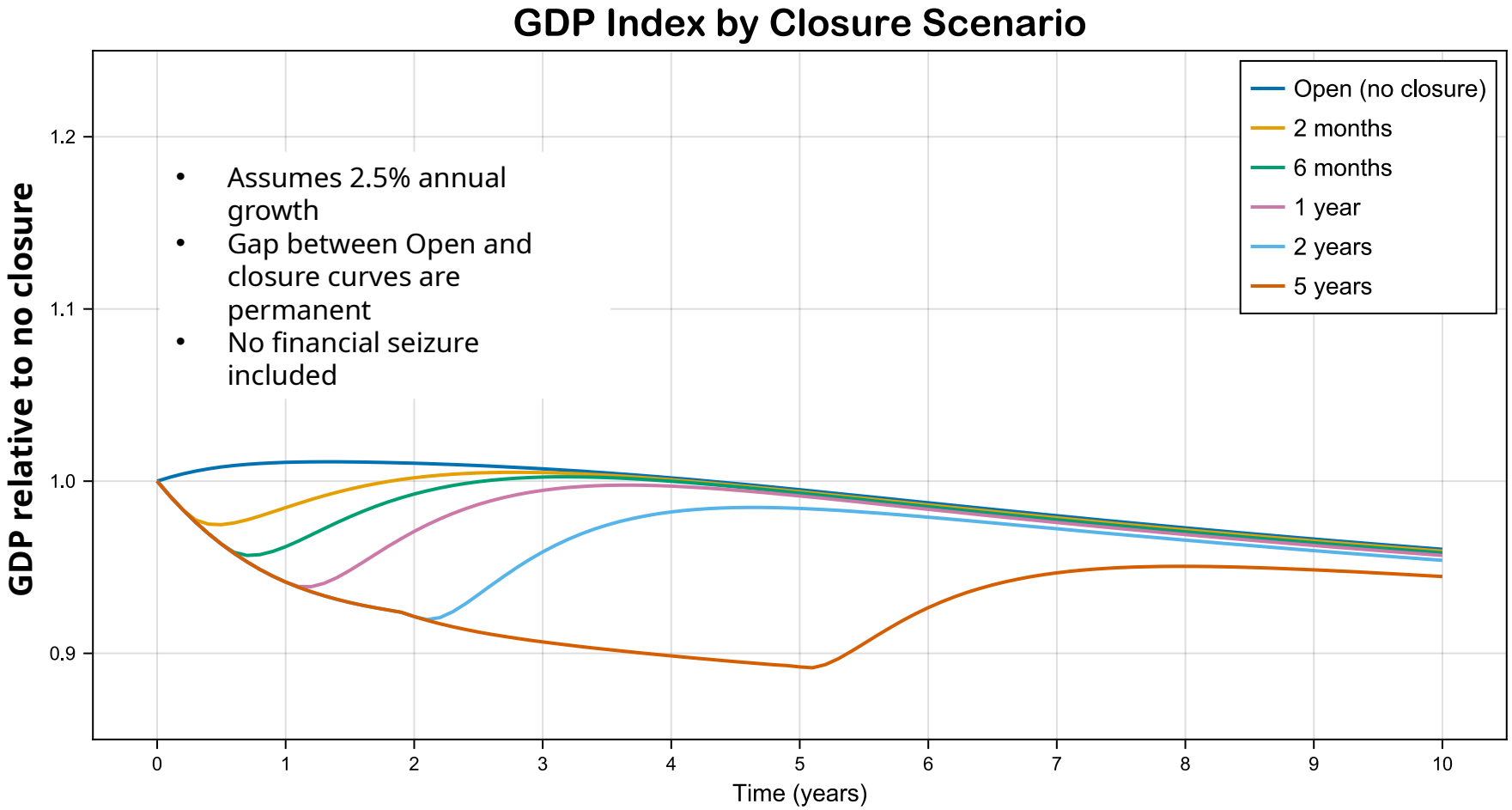


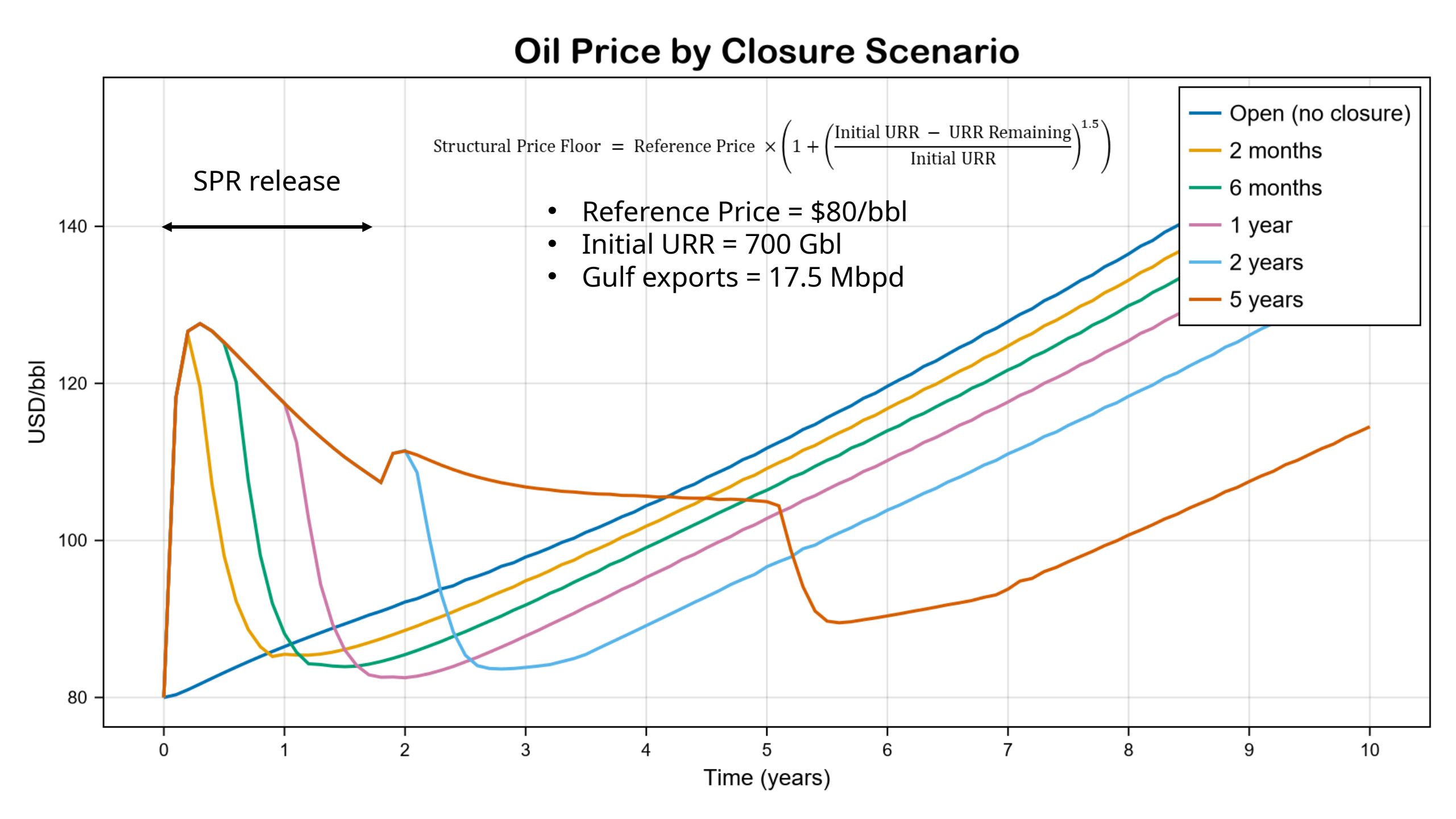
Expected Price Dynamics

- Initial crude spike $130-$140 / bbl within weeks of closure
- Demand destruction drives retreat — not supply recovery, but recession
- Structural price floor rising from depletion: price cannot return to $80 in any scenario
- Longer closures produce higher floors permanently
- Above ~$150: the model shows price signal; reality shows financial system seizure

How fast does the economy contract?

- Historical calibration: 1973 shock dropped GDP ~3%/yr.
- This shock is structurally larger: sustained gap of 12+ Mbpd vs a few Mbpd in 1973
- At $140 sustained, GDP possibly falls ~5.5%/yr initially.
- The feedback loop: High price → GDP contraction → demand falls → price moderates → structural floor from depletion holds.
- This is demand destruction by recession, not substitution to alternatives.
- Structural price floor from depletion holds regardless.


GDP Index by Closure Scenario
GDP relative to no closure
1.2
1.1
1.0
0.9
0
1
2
3
4
5
6
7
8
9
10
Time (years)
• Assumes 2.5% annual growth
• Gap between Open and closure curves are permanent
• No financial seizure included
Open (no closure)
2 months
6 months
1 year
2 years
5 years


Oil Price by Closure Scenario
$$\text{Structural Price Floor} = \text{Reference Price} \times \left(1 + \left(\frac{\text{Initial URR} - \text{URR Remaining}}{\text{Initial URR}}\right)^{1.5}\right)$$
SPR release
• Reference Price = $80/bbl
• Initial URR = 700 Gbl
• Gulf exports = 17.5 Mbpd
Open (no closure)
2 months
6 months
1 year
2 years
5 years
USD/bbl
140
120
100
80
0
1
2
3
4
5
6
7
8
9
10
Time (years)

The Sulfur Chain

- Gulf crude is *sour* — high sulfur content.
- The Gulf accounts for ~55% of internationally traded sulfur.
- Sulfuric acid is the workhorse of hydrometallurgy.
- Copper leaching requires 2-3 tons H_2SO_4 per ton of copper.
- Every EV, solar panel, and grid battery requires copper and other metals/minerals.
- At 85% closure: critical minerals supply falls ~40%.
- Middle East: 8–9% of global aluminum; Australia (diesel crisis): 26% of world bauxite; Gallium: 98% refined in China from Australian bauxite

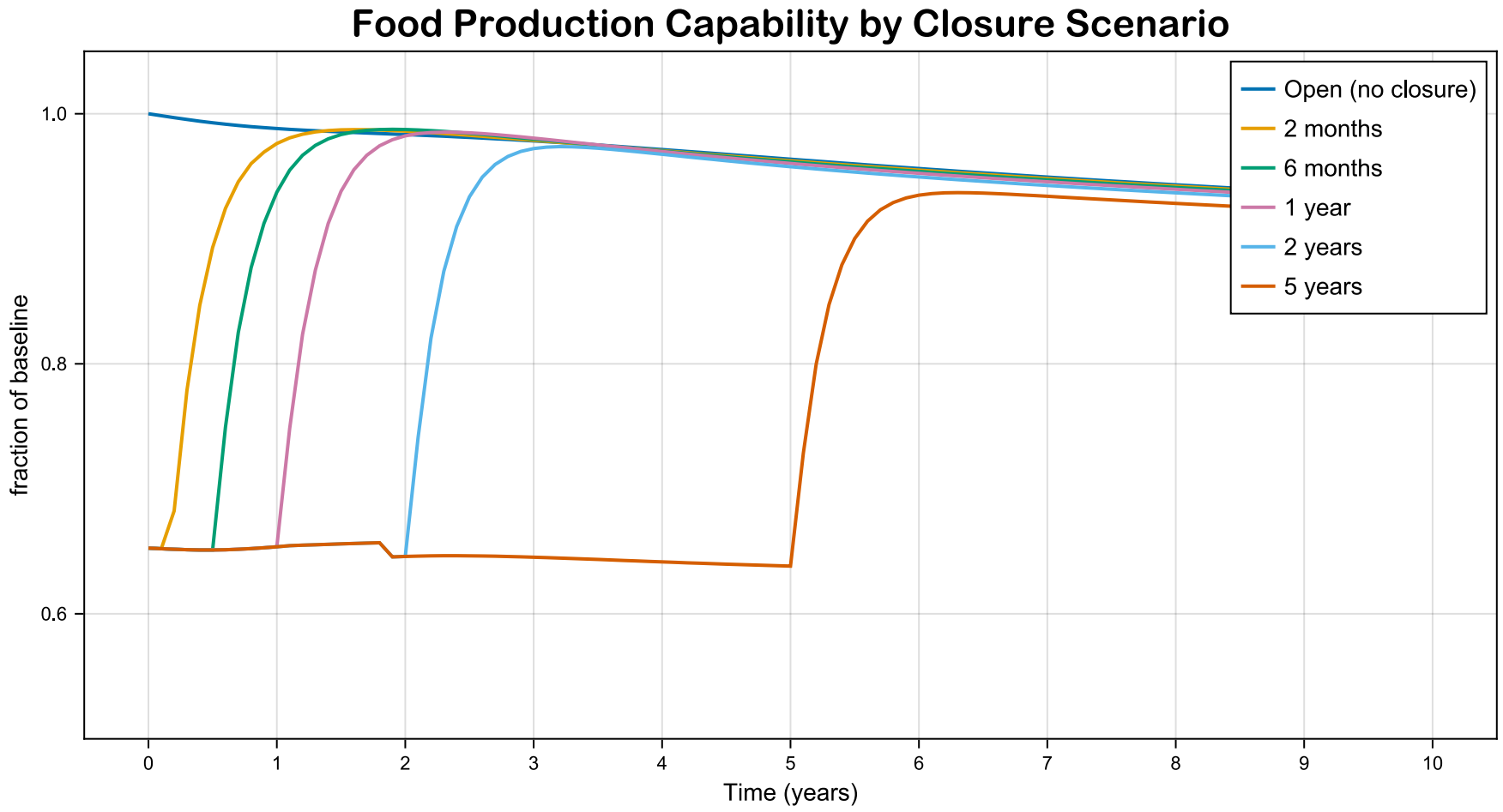
***"No oil, no green energy either."* — The Honest Sorcerer, April 2026**

The Delayed Fuse: Food

- Haber-Bosch nitrogen fertilizer requires natural gas.
- Phosphate fertilizer requires sulfuric acid.
- Spring 2026 planting decisions were made in February–March.
- Farmers planted less, substituted or applied at reduced rates.
- **That impact will not be visible until harvest — fall 2026 for most staple crops.**

The food supply shock is already baked in. It just hasn't arrived yet.

Agricultural Impacts

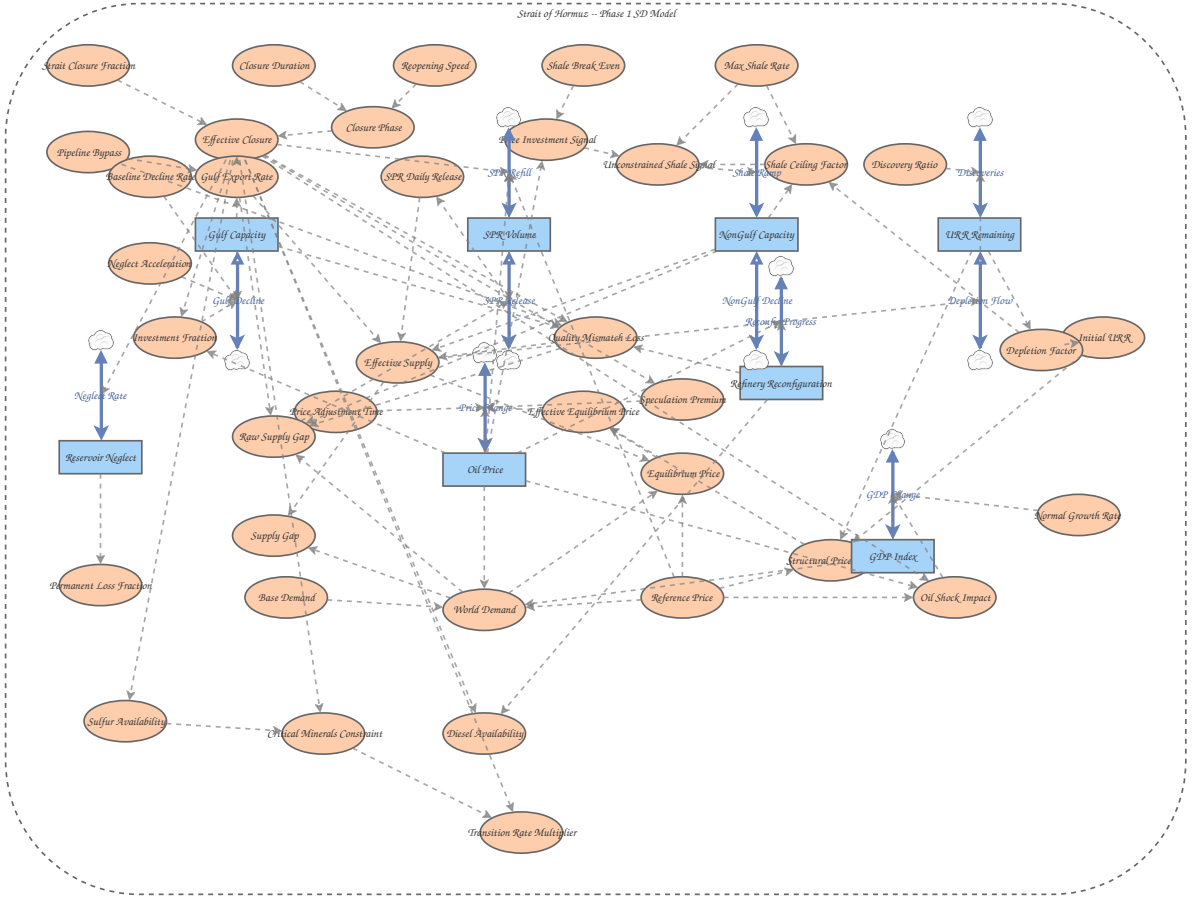


Reservoir Neglect Impacts

- Oil fields require continuous investment to maintain pressure
- No export revenue → no investment → decline accelerates from 4%/yr to 10%/yr
- After 3–5 years of neglect: gas cap damage, formation flooding, infrastructure corrosion
- These effects are permanent — a reopened strait does not restore capacity
- At 85% closure, the 3-year damage threshold is reached at ~3.5 calendar years
- 5-year closure → ~4.5% permanent Gulf capacity loss; 10-year → ~20%

System Dynamics Model

- System Dynamics models stocks, flows and feedbacks.
- Time delays and irreversibilities matter.
- 8 stocks, 11 flows, 38 auxiliaries — calibrated against IEA data and historical shocks.
- 17 calibration assertions pass at t=0 against historical values.



What the model cannot do:

- Predict when the Strait reopens.
- Model financial system seizure above ~$150/bbl.
- Model state failure or institutional collapse, no financial contagion included.

The model isn't a prediction machine; it's a way to make assumptions explicit and test their consequences.

What the model cannot tell us

- When the Strait will reopen
- Financial system seizure above $150/bbl
- Political instability and rationing responses
- Institutional capacity decay from sustained disruption
- Ecological feedbacks beyond the 10 year window
- State failure cascades (see Kemp: *Goliath's Curse*)

Three Questions Standard Analysis Fails to Answer

1. **Why is the diesel shortage worse than the crude shortage?** Crude quality mismatch — refineries cannot simply substitute light for heavy.

2. **Why will prices stay elevated even after reopening?** Depletion floor + reservoir neglect — both are structural and do not reverse.

3. **Why is "wait for shale to respond" not a sufficient answer?** Physical ceiling of ~2 Mbpd vs. ~12 Mbpd gap; wrong grade anyway

One Signal to Watch

- **If the linear model is right:** disruption resolves in 6–12 months, prices return toward $80
- **If the feedback model is right:** effects compound and some are permanent

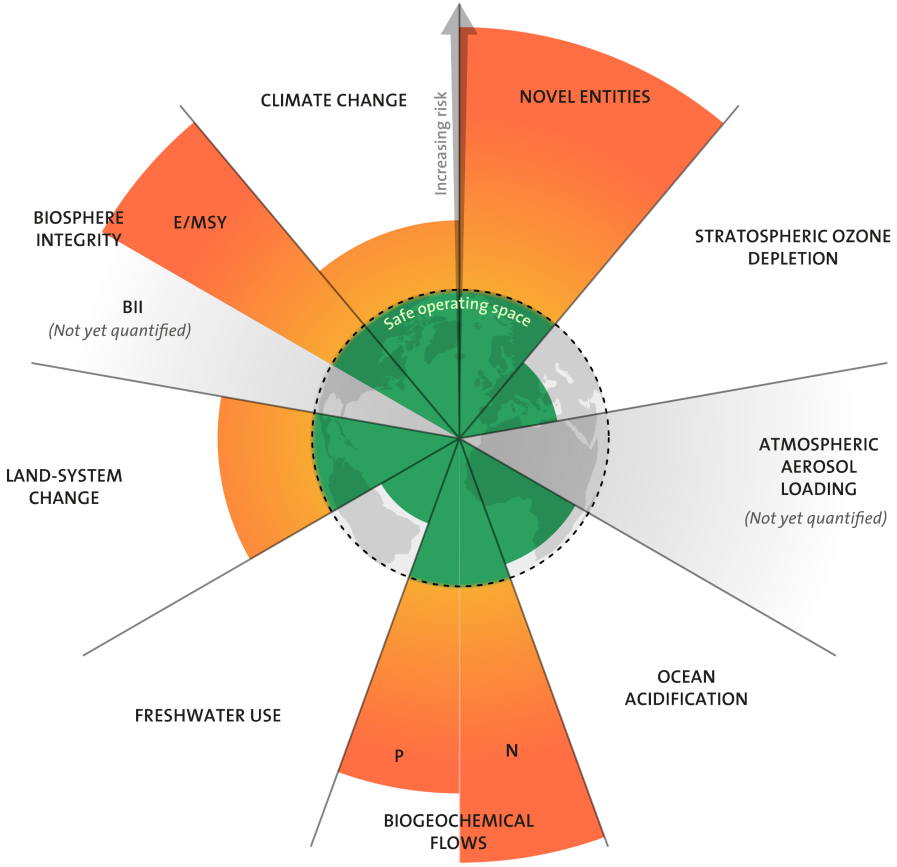
The distinguishing signal: **Diesel price premium**

If diesel trades at an unusually high premium to crude for more than 6 months:

- Crude quality mismatch is confirmed
- Recovery timeline extends dramatically
- Feedback model is correct

Energy Transition Viabil

- At 85% closure, all transition metrics drop immediately:
  - Sulfur availability: 0.53 (47% reduction)
  - Critical minerals constraint: 0.60
  - Transition rate multiplier: 0.56
- After reopening physical supply chains partial recover
- Previous talk showed:
  - Alternative energy sources are not self-sustaining
  - Energy sources are always compounded, not substituted
  - Alternative sources do not end planetary boundary limits



Summary

The Hormuz closure is worse than expected for three reasons standard analysis misses:

1. **Oil is not fungible:** Gulf heavy/sour crude cannot be replaced by shale. The diesel shortage is 20–35%. Refineries need a decade to adapt. The effective supply gap is larger than the headline number.
2. **The crisis attacks its own solution:** Gulf sour crude produces ~55% of traded sulfur. No sulfur → no sulfuric acid → no critical mineral extraction → no EVs, no solar panels, no grid batteries.
3. **Some effects do not reverse:** Reservoir neglect past ~3.5 years causes permanent capacity loss. The food shock from spring 2026 planting decisions arrives in fall 2026 regardless of when the Strait reopens.

The question is not whether there will be lasting damage – it is how bad will the damage be?