



Balancing Operational Resilience with Net-Zero Ambitions

A Sustainable Tomorrow
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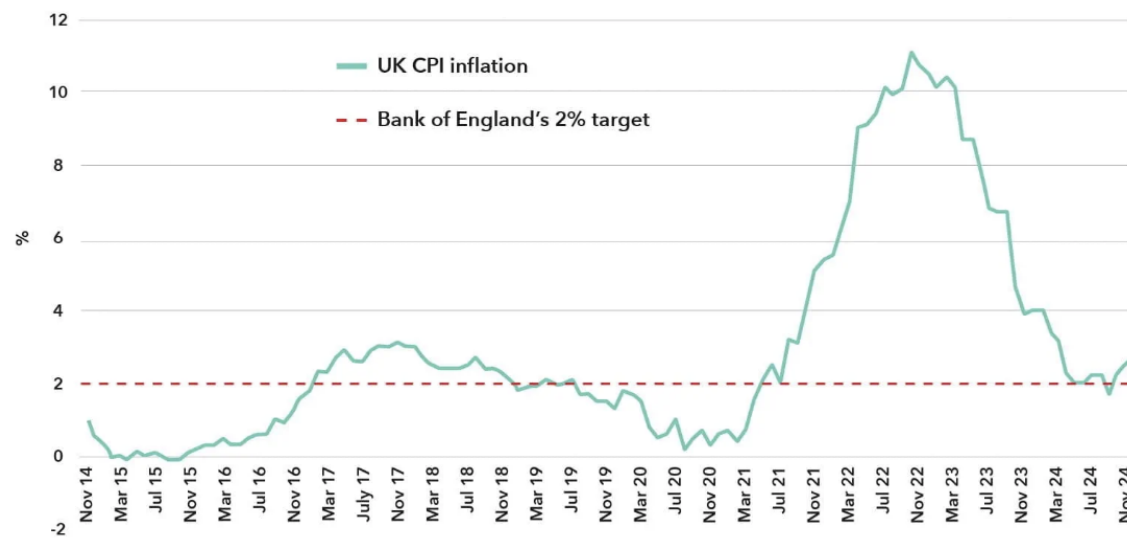
Workshop Agenda

- Welcome & Introductions
- Ice breaker: Sharing your own perspective
- Understanding Operational Resilience vs. Net-Zero Goals
- Activity: Resilience–Sustainability Matrix
- Supply Chain Shock Simulation
- Wrap-Up & Feedback

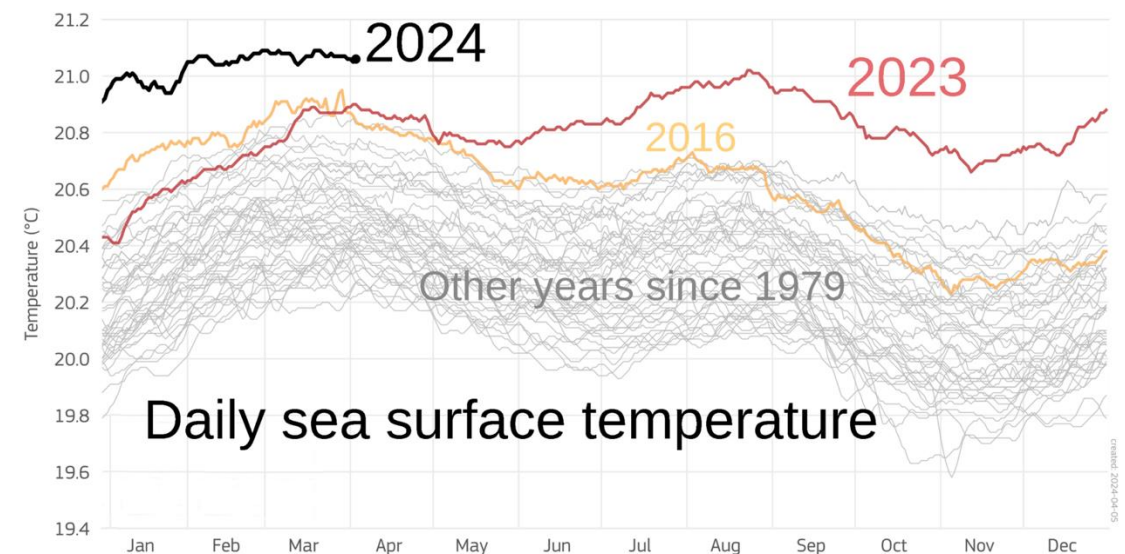
Why this Workshop Now

- Increasing climate volatility
- Pressures to decarbonise
- Operational fragility exposed by COVID-19, geopolitical tensions
- Need for integrated thinking

UK Consumer Price Index inflation



Source: ONS



Icebreaker

- What Resilience and Sustainability (focus on Environmental) mean in your industry/organisation?



Operational Resilience



- In one or two words, what does operational resilience mean to you?

Flexibility

Robustness

Readiness

Responsiveness

Business Continuity

Redundancy

Agility

Recovery

Buffering

Resisting Disruption

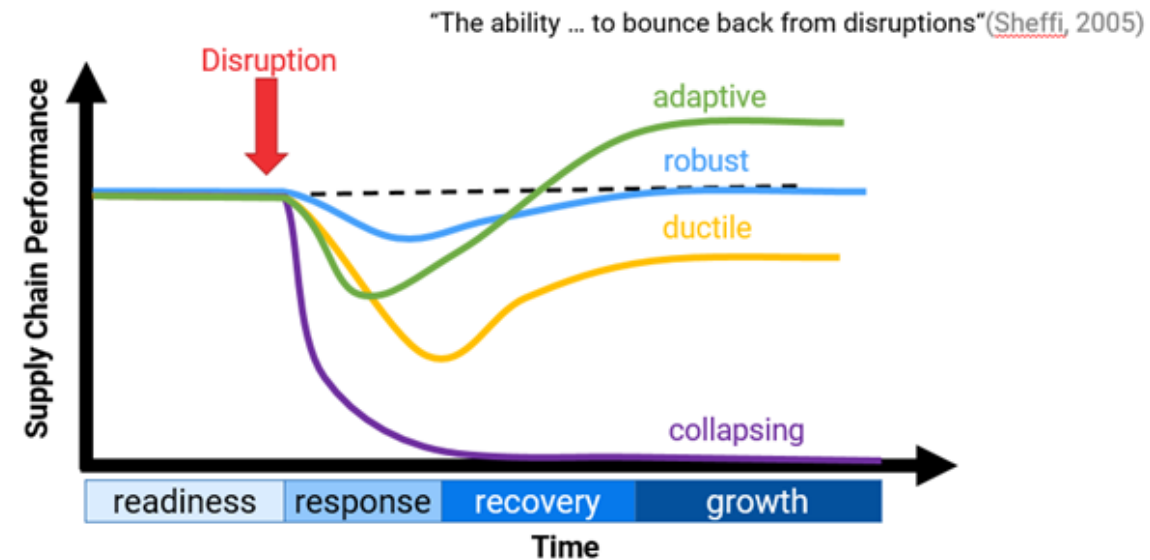
Contingency

Mitigation/Anticipation

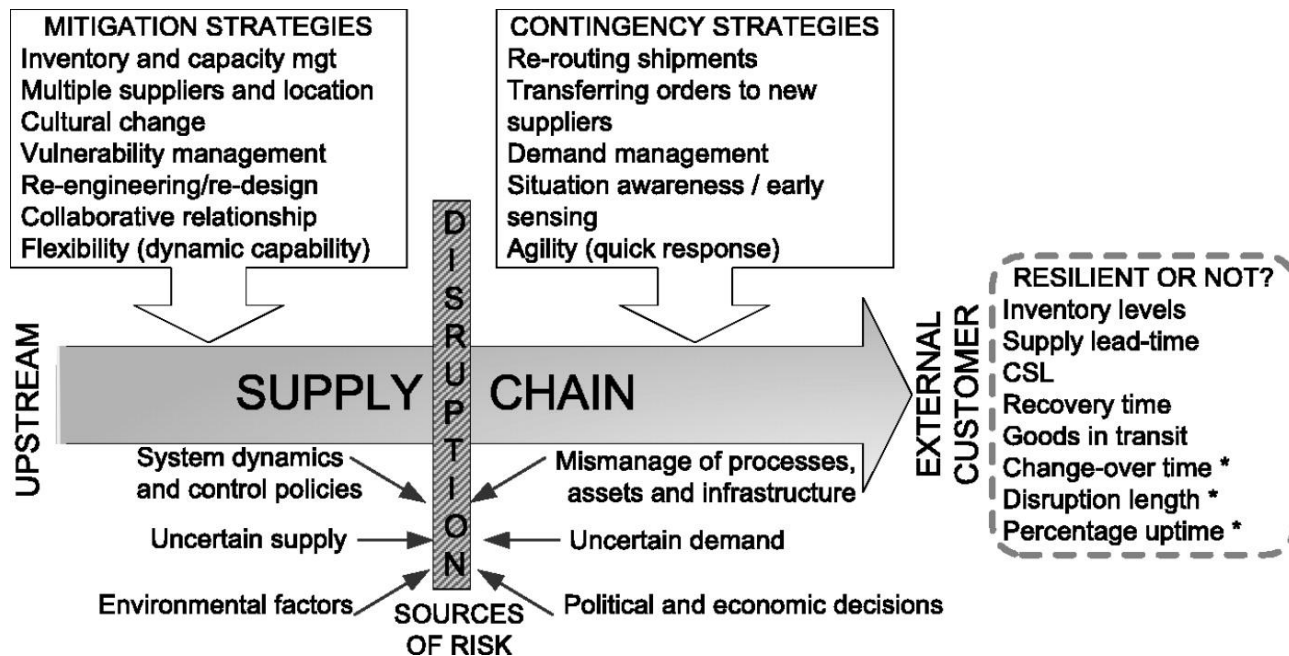
Operational Resilience

- The concept of resilience is widely explored across multiple disciplines, including
 - ecology
 - physics and engineering
 - psychology and
 - economics

- In **organisations**: ability to withstand turbulence, recover, or adapt to maintain operations and survive unexpected disruptions
- In SCs, resilience focuses on the ability of organisations within the SC network to coordinate and manage their partners ensuring continuity of and fulfilling customer demands during disruptions.



Industry practices for Operational Resilience



Spiegler et al. (2012)

New SC practices

- Nearshoring, reshoring and **local** sourcing
- **Real-time** dashboards for SC visibility
- **AI** for anticipating disruptions and recommending adaptive decisions
- **IoT** for real time monitoring of assets and operations
- **Blockchain** for secure, transparent and traceability

Other organisational level practices

- Infrastructure & Systems resilience
 - Redundancy **for energy, IT and communications**
 - **Backup** power sources (generators, batteries...)
 - **Cybersecurity** and breach recovery plans
- Workforce resilience
 - **Cross-training** employees and **flexible staffing** models
 - **Skills circulation** and **job sharing**
 - **Remote** work capability

Net Zero and Sustainability

- Net Zero: refers to reducing greenhouse gas emissions to as close to zero as possible, and balancing any remaining emissions with removals (e.g. through carbon capture or reforestation).

Net Zero

Environmental Variable	Impact of GHG Emissions
Natural Resources	- Alters ecosystems - Reduces resource regeneration - Affects biodiversity
Water	- Intensifies droughts and floods - Melts glaciers, raises sea levels - Reduces water quality and availability
Air	- Changes atmospheric composition - Often released with harmful co-pollutants - Contributes to smog and health issues
Energy	- Fossil fuels are major GHG source - Climate affects energy supply/demand - Drives need for clean energy transition
Land Use	- Emissions from deforestation, agriculture - Climate-driven land degradation - Land can act as a carbon sink



Industry practices for Net Zero

Manufacturing & Industry

- Switching to **renewable electricity** (solar, wind, hydro)
- **Electrification** of heating processes (e.g. replacing gas furnaces with electric induction)
- Waste **heat recovery** systems
- Upgrading to **energy-efficient** motors and drives
- Carbon capture and storage (**CCS**) for high-emission processes (e.g. cement, steel)

Logistics & Transport

- Fleet electrification (EV trucks, vans, forklifts)
- **Modal shift** from road to rail or water transport
- **Route** optimisation and **load** consolidation
- Use of sustainable fuels (e.g. **biofuels**, **green hydrogen**)
- **Idle-time reduction** technologies for trucks and ports

Commercial Buildings

- Retrofitting with efficient HVAC and insulation
- **LED lighting** and **smart** building controls
- On-site renewable energy generation (e.g. **rooftop solar**)
- **Green building** certification (e.g. BREEAM, LEED)

Retail & Consumer Goods

- Sustainable **packaging** (biodegradable, recyclable, lightweight)
- **Localised sourcing** to reduce transport emissions
- Product life extension through **repair, reuse, remanufacturing**

Agriculture & Food

- **Precision farming** (optimising fertiliser and water use)
- **Methane capture** from livestock and manure
- **Regenerative agriculture** helping capture and store carbon in soil
- **Reducing food waste** across the supply chain

Energy Sector

- **Shutting down coal**-fired power plants
- Investing in **renewable** energy infrastructure
- **Grid modernisation** and energy storage
- Demand-side management (e.g. pricing that encourages users to shift usage to off-peak)

Collaborative Practice for Net Zero: Industry Symbiosis

“Industrial Symbiosis is a collaborative approach where different businesses—often from diverse sectors—work together to optimise resource use by sharing materials, energy, water, or by-products.”

Turning one company's waste into another's raw material



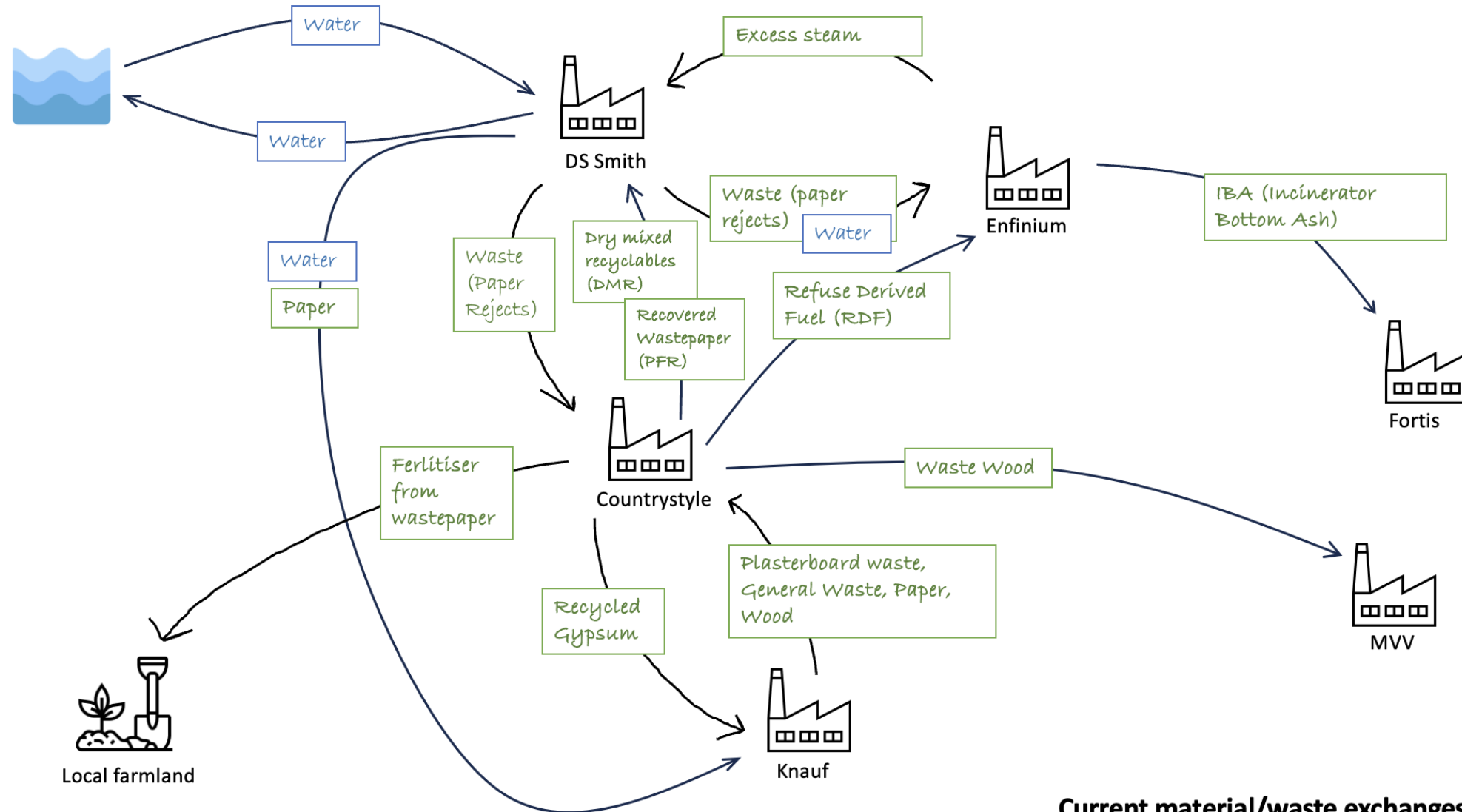
- **How does this help resilience?**

- By diversifying resource inputs, companies are less vulnerable to single-source disruptions.
- By sharing resources locally, they can bypass longer, riskier supply routes.

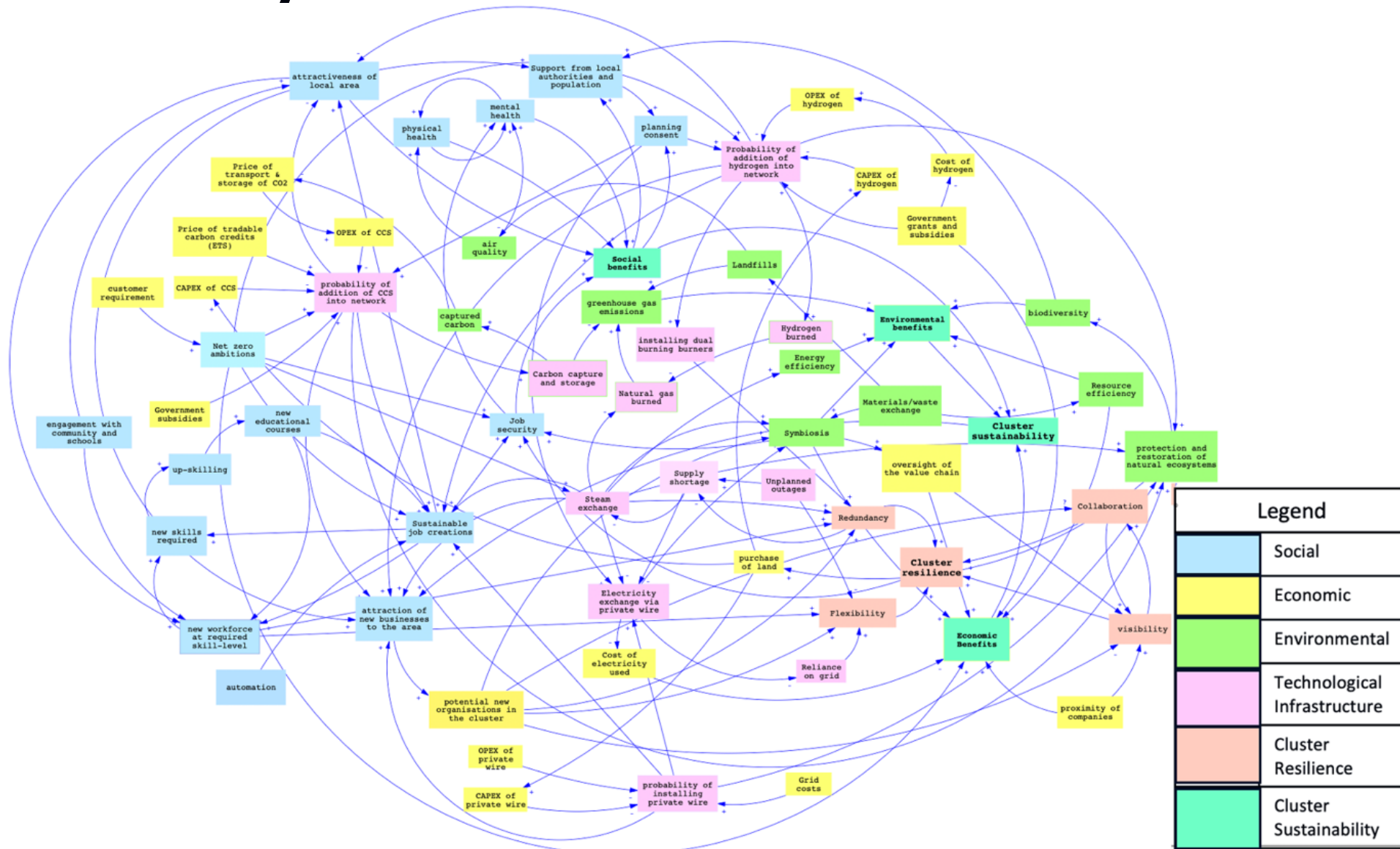
- **How does this help sustainability?**

- Reduced raw material extraction and waste disposal lowers carbon footprints.
- Energy and water reuse reduce environmental impact.

Kemsley Industrial Cluster



Kemsley Industrial Cluster

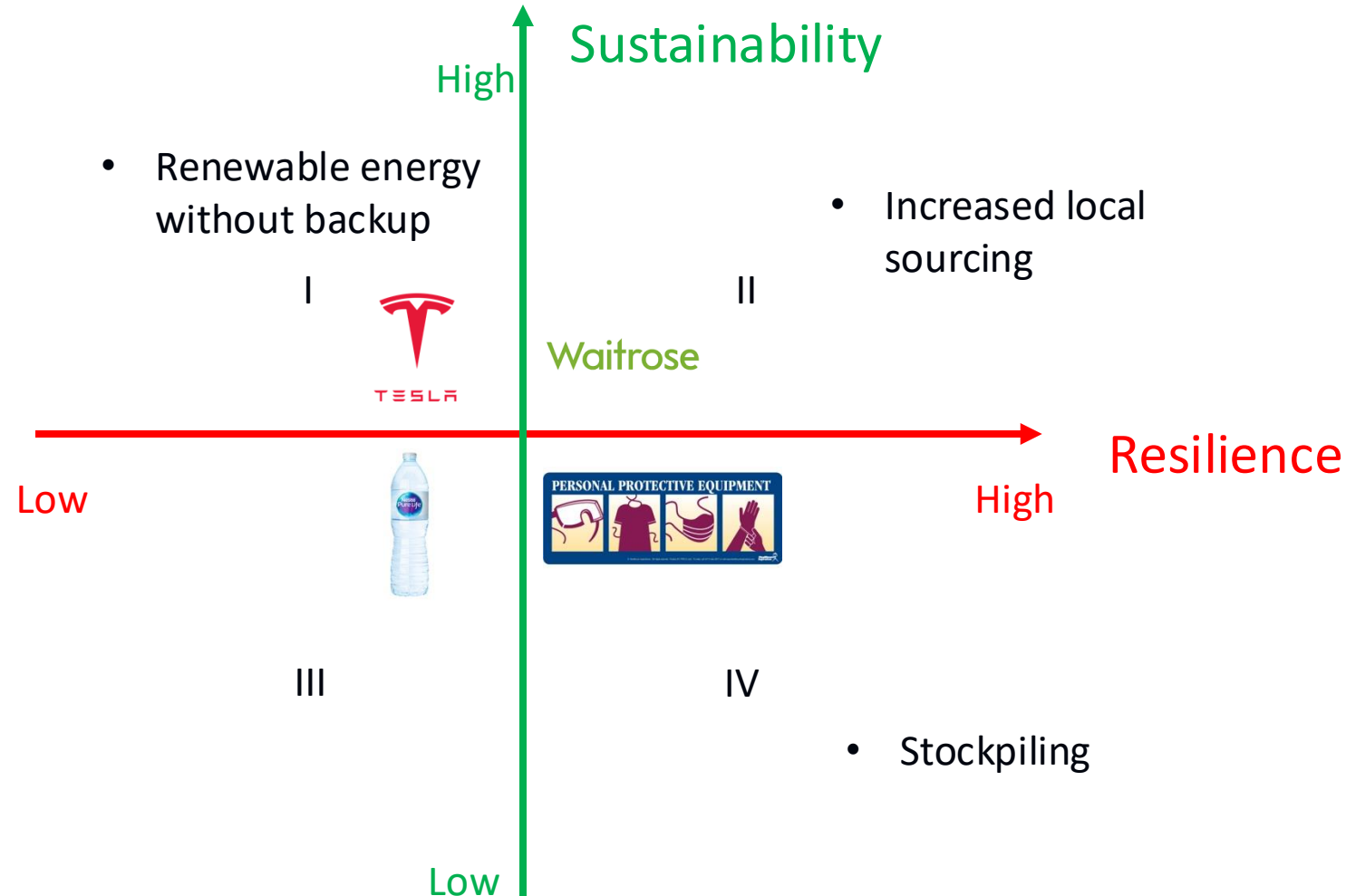


Activity: Resilience–Sustainability Matrix

Discuss the tensions and synergies between resilience and sustainability in your industry/organisation

- Synergy example: Shifting a greater proportion of sourcing locally reduces reliance on global supply chains and lowers transport emissions.
- Tension example: Stockpiling inventory, increases buffer during disruptions but leads to higher energy use and potential waste
- Tension example: Shifting to a single renewable energy system without back up (e.g. Tesla)

Find an example for each of the quadrants



Synergies between Resilience and Net Zero

Q II

Synergy	Resilience Benefit	Sustainability Benefit
Local circular sourcing	Reduces reliance on global supply chains	Cuts emissions from transport and waste
Renewable-powered microgrids	Provides energy independence	Supports decarbonised energy systems
Digital twins and predictive analytics	Anticipates and mitigates disruptions	Optimises energy use and resource efficiency
Modular manufacturing systems	Enables fast reconfiguration and scaling	Reduces overproduction and energy waste
Shared logistics hubs with green fleets	Spreads risk across partners	Consolidates shipments, uses electric vehicles
Reverse logistics and repairability	Extends product lifecycles, buffers shortages	Supports circular economy principles
Supplier engagement on both risk and emissions	Builds collaborative response to shocks	Drives down emissions collaboratively

Tensions between Resilience and Net Zero

Q IV

Tension	Resilience Focus	Net-Zero Impact
Stockpiling inventory	Increases buffer during disruptions	Leads to higher energy use and potential waste
Redundant suppliers	Ensures backup sourcing	May include high-carbon suppliers or less efficient transport
Diesel backup generators	Provides power continuity	High emissions, counter to decarbonisation efforts
Expedited air freight	Maintains delivery timelines	Higher carbon footprint compared to sea or rail
Reshoring to secure supply	Shortens and simplifies supply chains	May increase emissions if domestic production is less green
Overengineering for robustness	Minimises risk of failure	Can be resource-intensive and carbon-heavy
Cold storage for perishables	Protects products from spoilage	High energy use, especially if not powered by renewables

Tensions between Resilience and Net Zero

Q1

Tension	Sustainability Benefit	Resilience Impact
Just-in-Time with green supplier	- Minimises inventory waste - Reduces emissions from storage and overproduction	- Vulnerable to supplier or transport delays - No buffer during disruptions
Electric-only delivery fleet with no diesel backup	- Zero tailpipe emissions - Supports decarbonisation targets	- Dependent on grid stability and charging infrastructure - Limited fallback in outages
Organic farming with low-input systems	- Reduces chemical use - Enhances soil and ecosystem health	- Lower yields - High sensitivity to weather and pest shocks
Rainwater-only irrigation	- Saves freshwater resources - Low-energy input	- Ineffective during droughts - No alternative water source
Locally sourced, low-carbon materials with no backup suppliers	- Cuts transport emissions - Supports local economy and footprint	- Lack of redundancy - Susceptible to regional disruptions
Recycled materials with limited availability	- Reduces raw material extraction - Lowers embodied carbon	- Risk of inconsistent supply - May not meet volume or quality needs
Renewable energy systems without backup	- Produces zero emissions - Reduces fossil  reliance	- Intermittent generation - No energy continuity during low supply periods (e.g. no sun, no wind)

Supply Chain Shock Simulation



- Let's challenge your decision-making under pressure with a dynamic simulation called *Supply Chain Shock*
- This exercise is designed to reflect the kinds of real-world disruptions that supply chains — and broader operations — face regularly

In teams, you'll work through a series of disruption 'rounds,' each presenting a different scenario. For each one, you'll choose a response strategy from a set of options. Each decision will carry consequences across three areas:

Resilience — how well your business bounces back,

Sustainability — measured in terms of greenhouse gas emissions, and

Finance — the cost or savings associated with your decision.

Your goal is to find the best trade-offs — not just to survive the disruption, but to do so responsibly and strategically.”

Round 1: Supplier Factory Fire

- Your key supplier's factory is shut down due to a fire.

Decision Options

- Switch to backup local supplier
- Import from overseas supplier
- Use existing inventory and delay production



Round 2: Geopolitical Trade Ban

- New trade restrictions block shipments from a major country.

Decision Options

- Source alternative materials locally
- Pay higher tariffs to keep using existing supplier
- Reduce production volume temporarily



Round 3: Labour Strike at Distribution Centre

- A strike halts operations at your main warehouse.

Decision Options

- Use third-party logistics provider
- Delay shipments to customers
- Use smaller regional warehouses

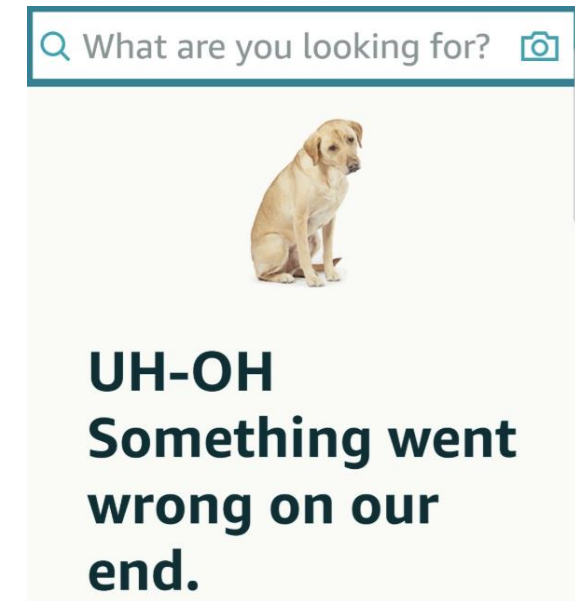


Round 4: Major Online Platform Outage

- Your main online sales platform crashes during peak shopping season.

Decision Options

- Redirect customers to physical stores
- Use third-party e-commerce platform
- Delay order processing until platform recovers



Round 5: Call Centre Staff Shortage

- High absenteeism at call centres due to flu outbreak

Decision Options

- Use AI chatbots to handle simple queries
- Outsource to overseas call centres
- Delay non-urgent customer requests



Round 6: Banking Fraud Detection System Failure

- Your fraud detection software malfunctions

Decision Options

- Increase manual transaction reviews
- Temporarily reduce transaction limits
- Outsource fraud detection to a third party



Round 7: Cross-Border Carbon Tax Introduced

- A new carbon border adjustment mechanism increases the cost of importing from a high-emission supplier

Decision Options

- Pass the cost increase to customers without changing supplier
- Negotiate carbon-offset deal with existing supplier
- Reengineer product to use less imported material



Key Takeaways

- Resilience and net-zero are not always aligned — but **can be** with thoughtful design.
- **Tensions** exist (e.g. single green suppliers, no backups), but so do **synergies** (e.g. local renewables, shared logistics).
- The goal is not to eliminate all tensions but to manage **trade-offs** while maintaining long-term viability and responsibility.

“There is no perfect answer—only informed, balanced decisions.”

- Balancing resilience and sustainability requires exploring a **variety of practices and approaches**.

Reflective Questions to Ask When Facing a Disruptive Event

- What are we trying to protect or preserve?
 - Core operations?
 - Brand reputation?
 - Environmental and/or financial commitments?
- Do we risk undermining long-term goals for short-term stability?
- Are we over-prioritising continuity at the cost of sustainability (or vice versa)?
 - Can we find a lower-impact option?
- What are the hidden vulnerabilities this disruption has exposed?
- Can this disruption be an opportunity to rebuild better?

“Building a future-ready organisation means preparing for uncertainty and meeting climate commitments. These goals don’t always pull in the same direction, but with smart, adaptive design—they can reinforce each other.”

Thank You.

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