Sustainable and Resilient Supply Chains

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National Academies of Sciences, Engineering, and Medicine

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Both Sustainability and Resilience are SUPPLY CHAIN Issues

Sustainability

- 2/3 carbon emission of most companies is in their upstream supply chain
- For some products, most of the emissions are in the use phase (downstream)
- So looking just at a company's environmental impacts is misleading.

Resilience

- A manufacturing company needs material, parts, transportation, warehousing…
- Dependence on suppliers: modern products require significant specialization
- So looking just at the assembly stage ("made in the US") is close to meaningless.

Corporate Goals

- Objectives:
  - Maximize revenue
  - Minimize costs
- Subject to:
  - Comply with regulations
  - Build resilience
  - Be sustainable
  - Empathy
    - Employees
    - Communities
    - Charity
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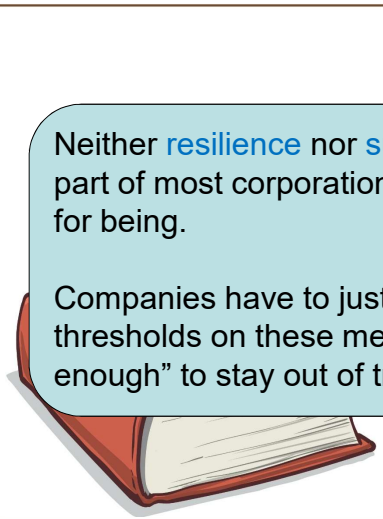
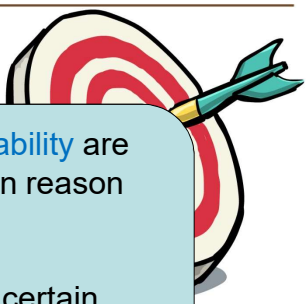




Neither resilience nor sustainability are part of most corporations' main reason for being.

Companies have to just meet certain thresholds on these metrics; do "just enough" to stay out of trouble

Achieving Resilience and Sustainability

	Sustainability	Resilience
Market forces	Carbon tax (or Cap & Trade)	Continued disruptions (?)
Changing attitudes	Educating consumers	Millennials (?)
Government regulation	Ex: Biden's executive orders	Required inventory levels; manufacturing location

The problem: these are either "feel good" ideas and wishful thinking, or involve negative "side effects."

The Issues with Resilience

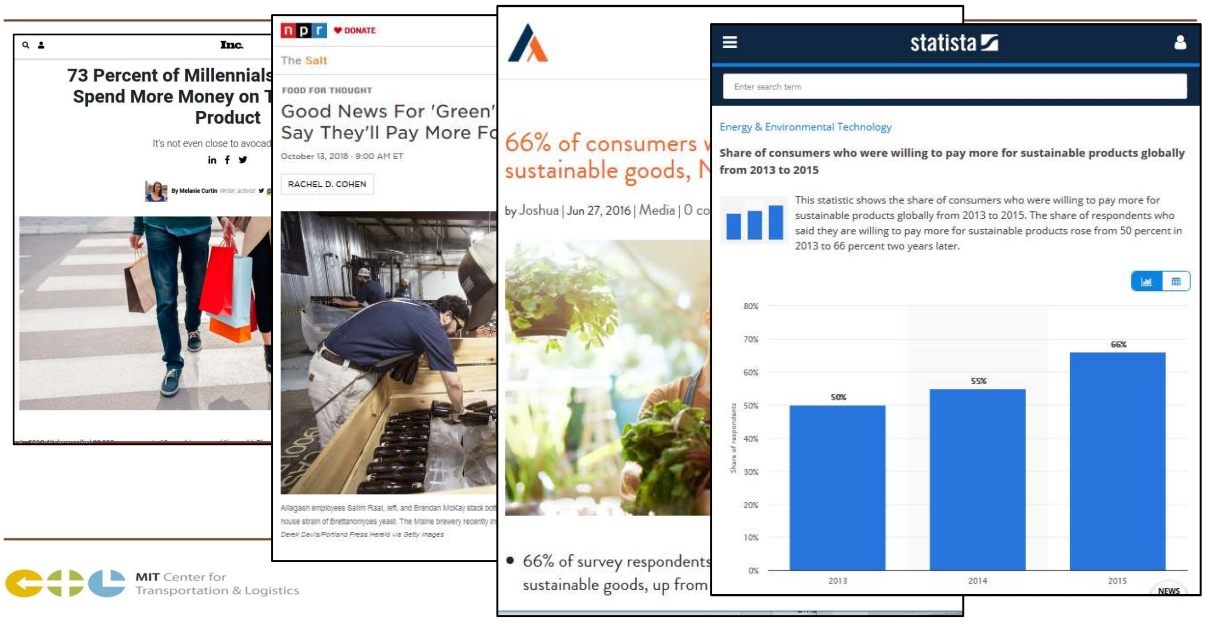
"Solutions":

- Extra inventory
- Multiple suppliers
- Cross training
- Re-shoring

Reality:

- Higher costs
- Loss of scale
- Reduced revenue
- Reduced quality

The Issues with Sustainability - Consumers



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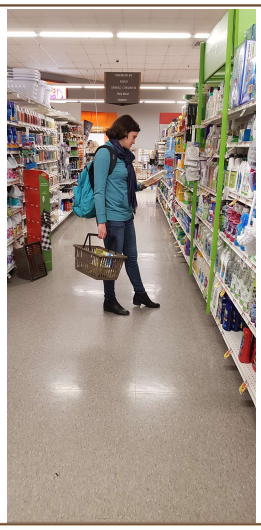
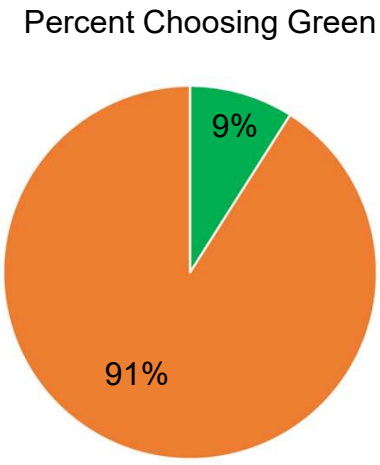
Really ???





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The "Pretend" Sustainability (Companies)

McDonald's Is Phasing Out Straws

The replacement is way more environme

by MADISON FLAGER APR 4, 2018

Forbes

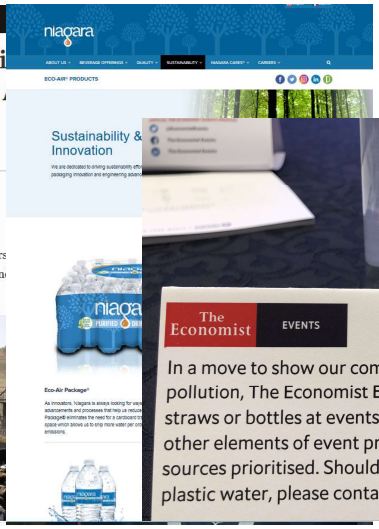
Scientists Underesti
How Bad Cow Farts

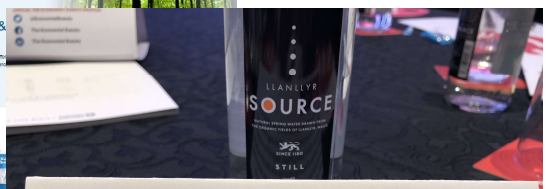
Sam Lemonick Contributor
Science

TWEET THIS

Farts are funny. Global warming is not.

Animal farts and poop are major contributors
warming. It turns out we might have been un
just how much.





The Economist EVENTS

In a move to show our commitment to the reduction of plastic pollution, The Economist Events will no longer be using plastic straws or bottles at events. Plastic usage will be minimised in all other elements of event production and alternative sustainable sources prioritised. Should you require plastic straws or bottled plastic water, please contact hotel server for assistance.

The "Pretend" Sustainability (Companies)

BNP PARIBAS
The bank for a changing world

The "Pretend" Sustainability (Companies)

Neither resilience nor sustainability investments are compatible with short term profit maximization beyond:

- Eco-business
- Eco-efficiency
- Eco-risk mitigation
- Eco-hedging

Is Government Interventions the Answer?

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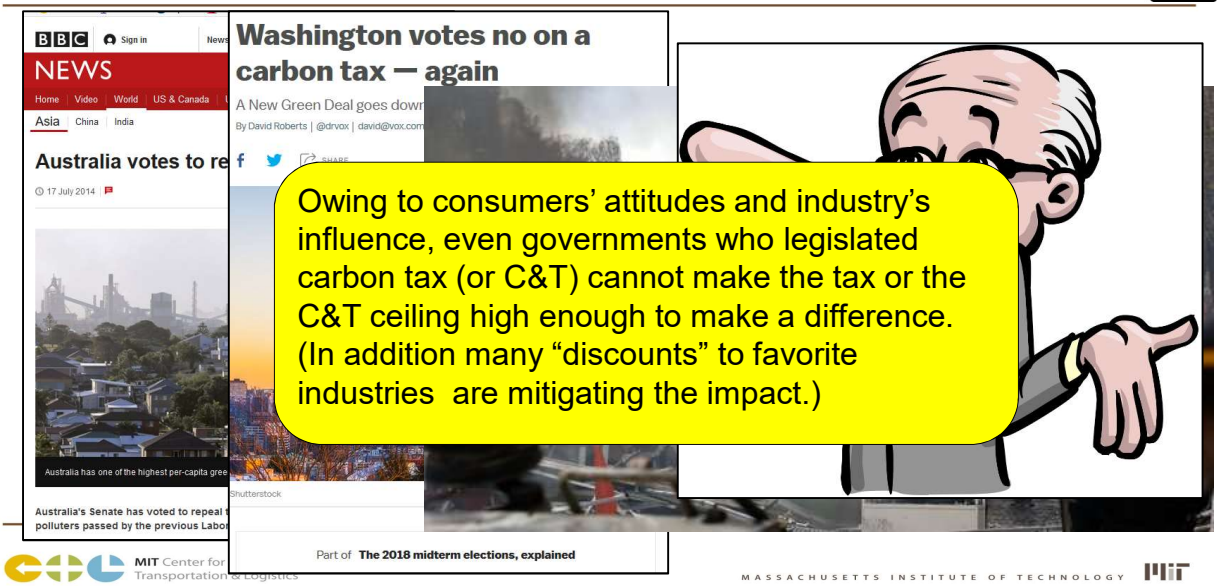
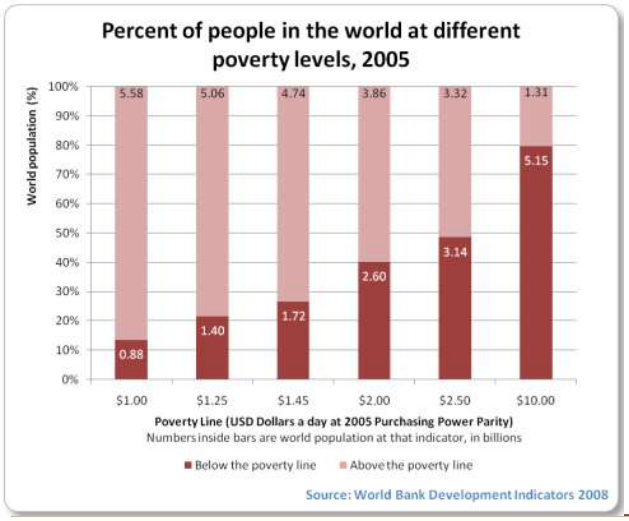


Owing to consumers' attitudes and industry's influence, even governments who legislated carbon tax (or C&T) cannot make the tax or the C&T ceiling high enough to make a difference. (In addition many "discounts" to favorite industries are mitigating the impact.)

And What About the "Others"?



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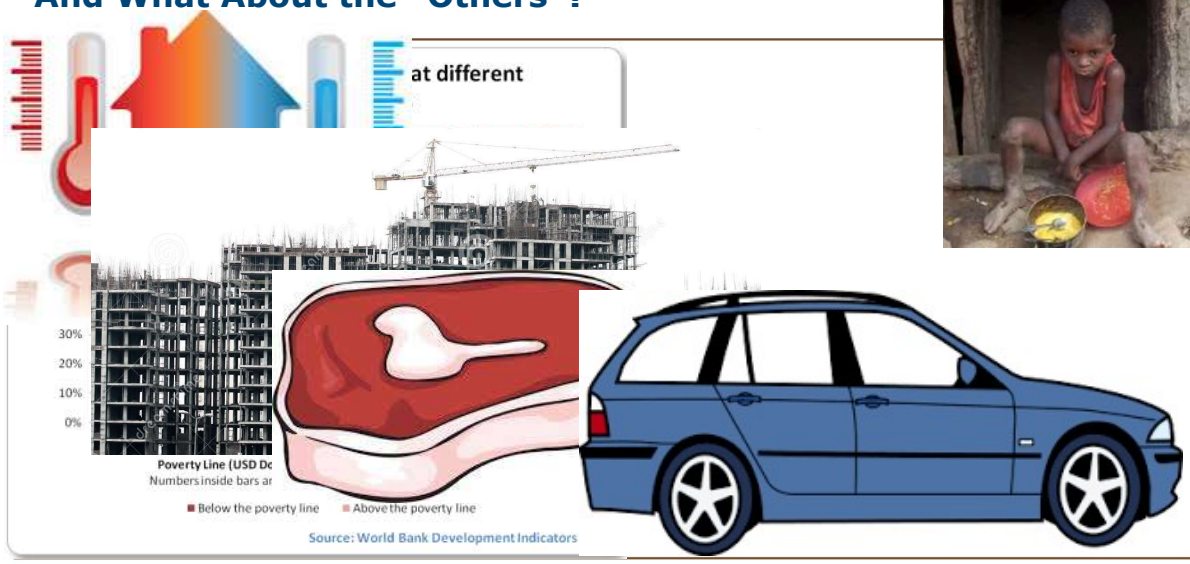
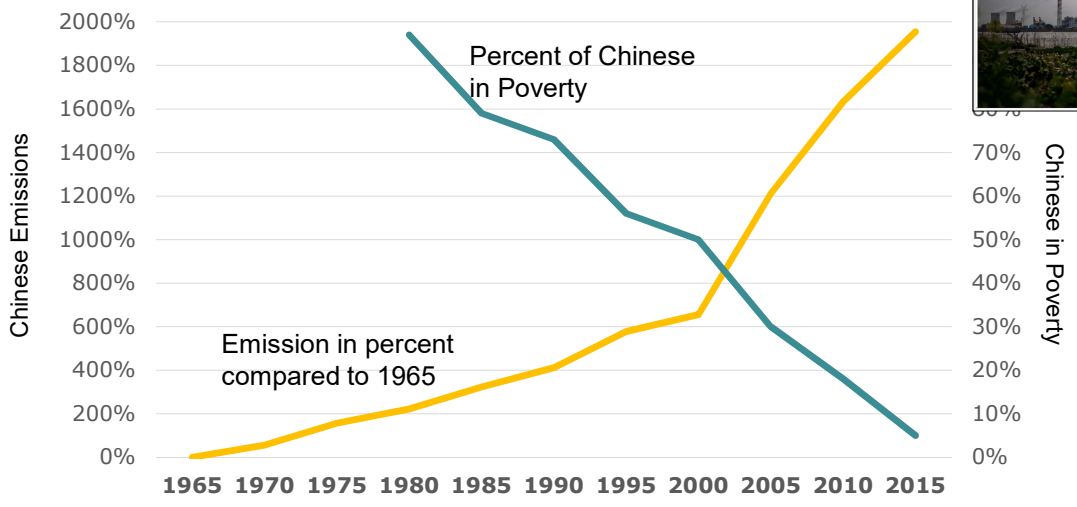


China Growth and Emissions



Following the Pandemic

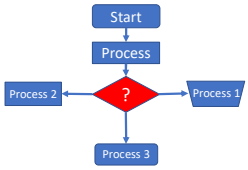
- Many consumers are poorer – cost emphasis
- Companies are even less likely to invest (beyond PR)
- Governments also will have to pay for the Covid-19 fight

Resilience: Prepare Options for the Responders

- Forecasting
  - #1 rule: always wrong
- Flexibility
  - Cross-training
  - Standardization
  - Collaboration
  - Postponement
  - Culture

Resilience (with Sustainability Bonus): Less long term commitments

- Transportation: Own fleet => contract => spot => gig
- Use of warehouse Air BnB for business fluctuations
- Use hedging and options rather than commitments
- Conditional contract items

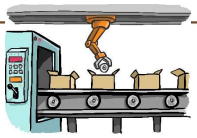


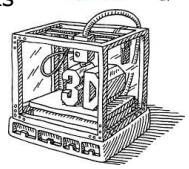
Conclusions from the Pandemic

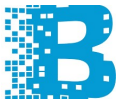
- Behavior change does not work even in the face of clear and present danger
- The solution: technology

ICT Advances

- **Automation**
  - Digital control/Robotics/RPA
  - Autonomous vehicles/trucks
  - Drones
- **3D printing**
- **Automatic input**
  - Sensing
  - IoT - visibility
- **Computing**
  - Artificial intelligence
  - Big data
  - Cloud computing
  - Block chain







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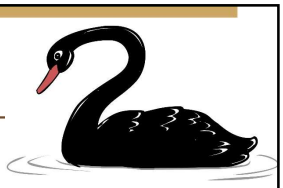
Many of these technologies are hammers looking for a nail.

Relevant Technological Solutions

- Resilience

- Sustainability

Note: Black Swans Come in all Colors



- When we talk "resilience" we have in mind the fight against Covid-19
  - WFH
  - E-commerce
  - Reduced travel => reduced emissions

- What if the next disruption is a massive cyber-attack (down Internet; grid)?
  - No WFH
  - No e-commerce
  - Cash economy

Further Reading

https://sheffi.mit.edu/

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