The Efficiency Paradox: Why technology is only part of THE solution

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Basic statistics:

- Transportation consumes:
  - 27.8% of the total energy, and 70% of the petroleum
- Transportation produces:
  - 53% of the carbon monoxide, 31.3% of the nitrogen oxide, 24.2% of the volatile organic compounds, and 39.3% of the carbon dioxide
- Transportation is:
  - A key engine of economic development and globalization, accounting for 9.8% of the US GDP
  - A major source of employment (1 out 4 workers are in trucking and logistics)
- World population is increasingly urban (50% now), by 2050 → 70% (IBM's interest is no coincidence)

The Center of Excellence for Sustainable Urban Freight Systems

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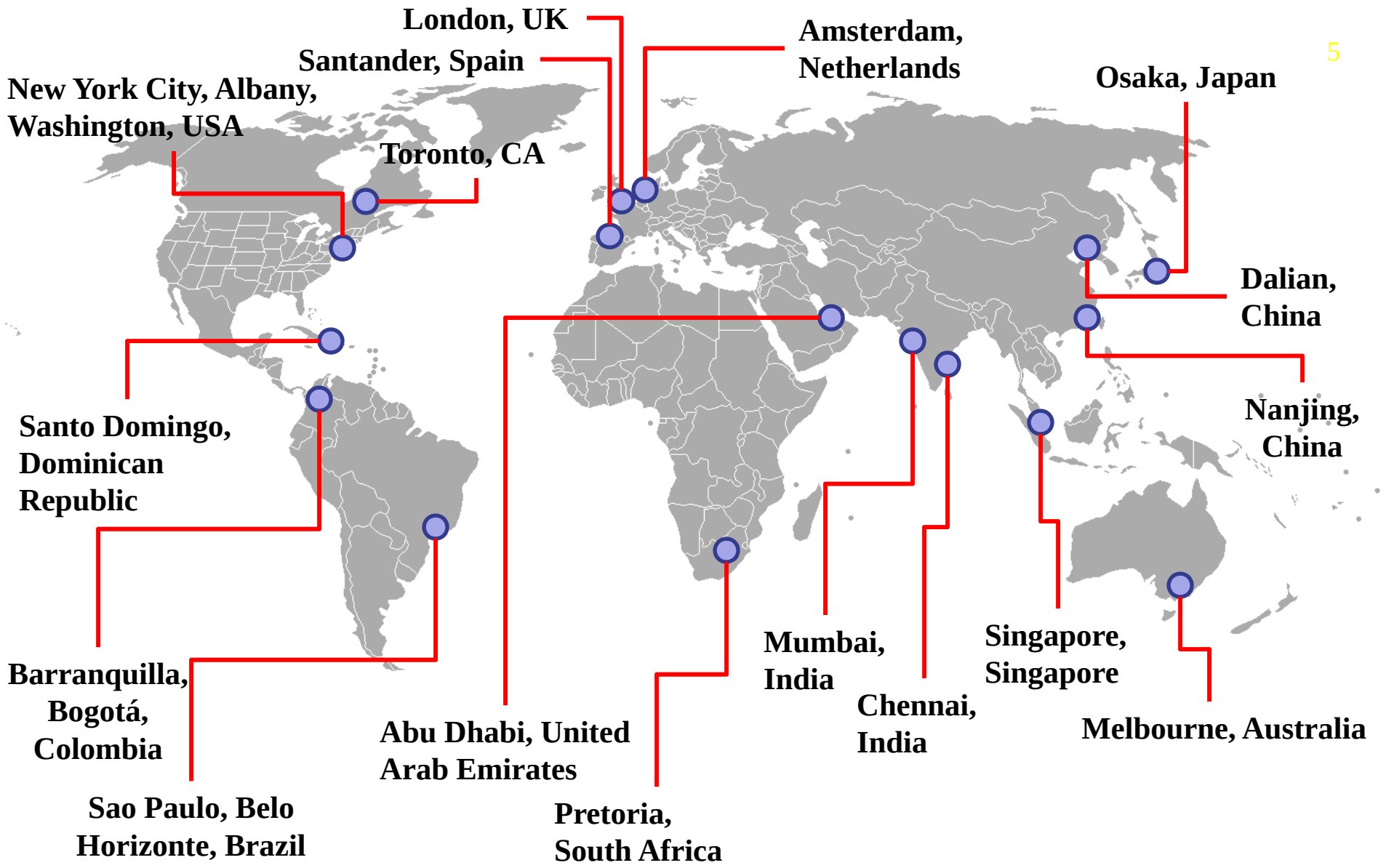
The CoE for Sustainable Urban Freight Systems

The Goal:

- To jumpstart an integrative process—involving cities, private sector, and researchers—that will lead to the implementation of new freight systems paradigms that:
  - Are sustainable
  - Increase quality of life
  - Foster economic competitiveness and efficiency
  - Enhance environmental justice
- A bit of news: Producing a comprehensive handook on how to improve freight systems in metropolitan areas



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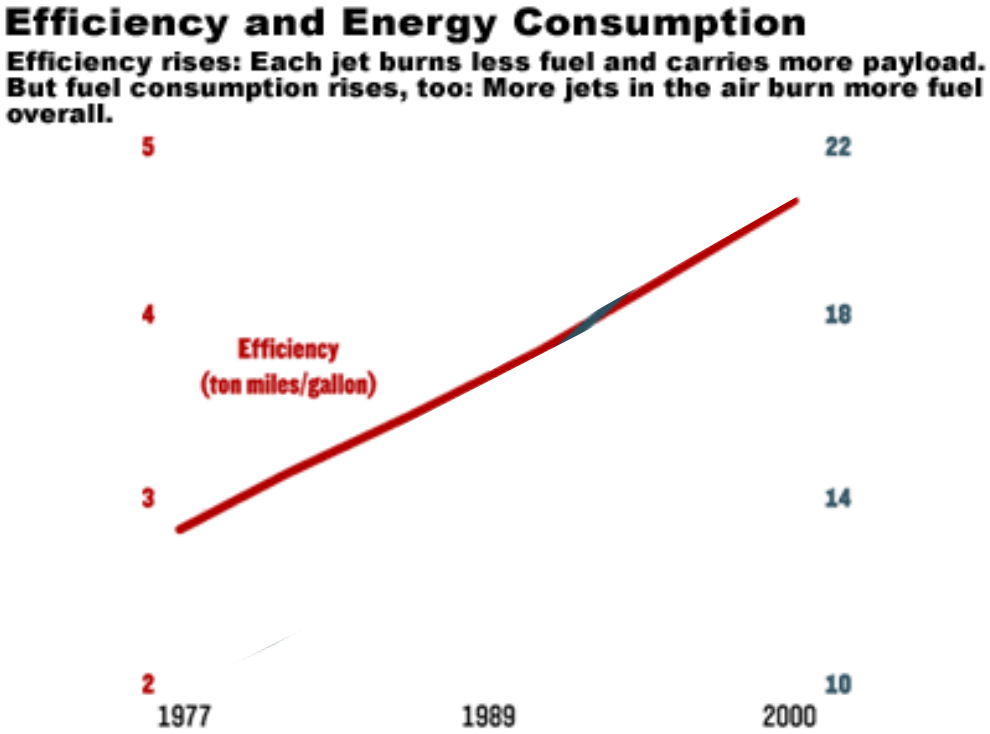
The Efficiency Paradox

The Efficiency Paradox

The lessons of history ...

- "The historical facts are beyond dispute: When jet turbines, steam power plants and car engines were much less efficient than they are today, they consumed much less total energy, too." (Huber, 2001)



We need
something else,
in addition to technology

Key components of a holistic approach

- Policies that foster behavior change
  - We (users, consumers, businesses, etc.) have to change the way in which we do things
  - Incentives are needed
  - Research helps understand how best to accomplish this
- Technologies:
  - Needed to reduce the consumption rates, mitigate/ remediate the damage produced by economic activity, manage the use of resources, etc.
- Redesign the economy and urban environments
  - Sustainability (or lack of) is a design problem

Our work touches these three key components

The role of public policy

- The reality is that electric vehicles:
  - Are more expensive than the ones with traditional engines
  - Suffer from an image problem (that is improving...)
  - Are undoubtedly better for the environment
- As a result of the cost, companies that purchase EVs may put themselves at a disadvantage vis-à-vis competitors that use traditional trucks
  - Exactly the outcome we do not want
  - We need to reward good behavior and punish bad ones
- Incentives are the key

Incentives

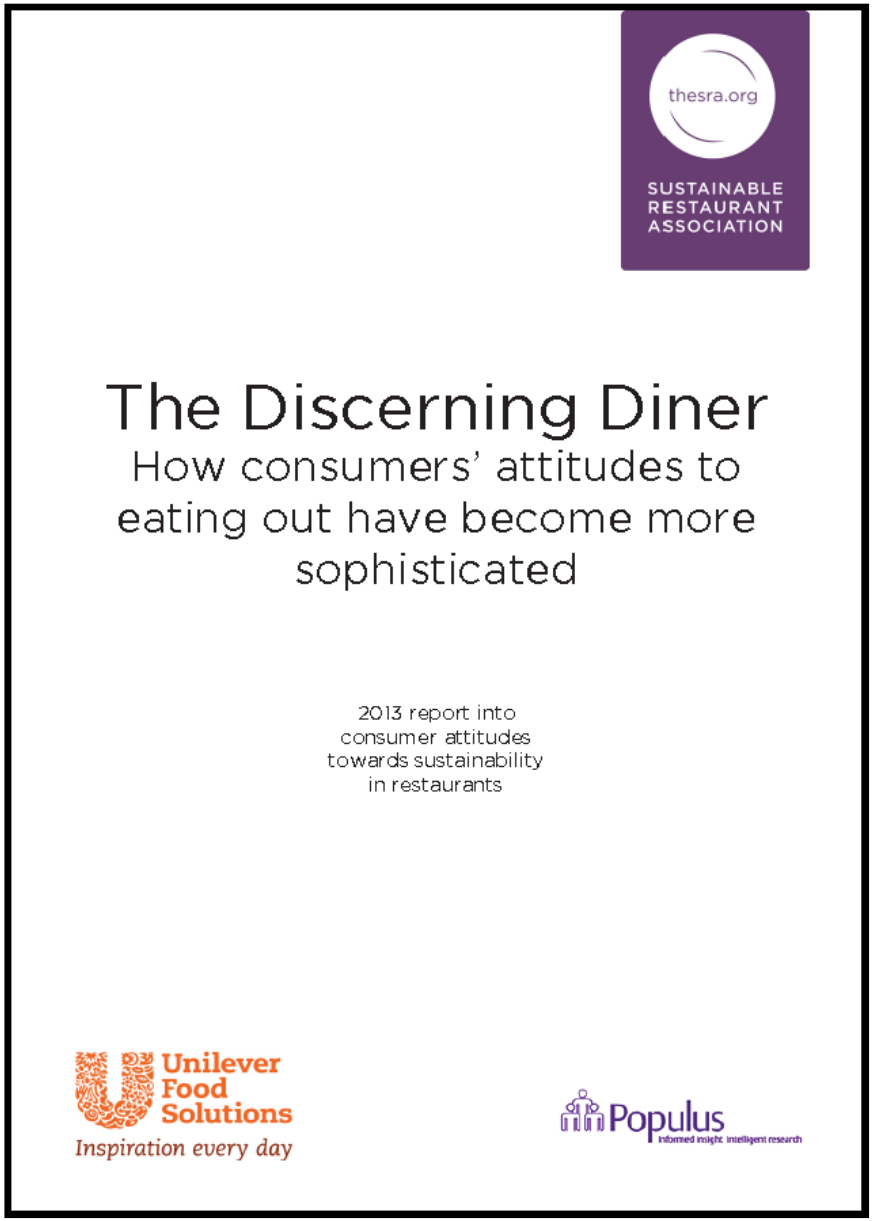
- Vouchers, like the ones in NYS, are a good thing though they may not tilt the balance of costs
  - They only appeal to environmentally conscious companies that value good PR
  - Not enough to convince the masses of companies making the 300,000 deliveries per day to Manhattan
- Public sector incentives will be hard to come by in financially constrained times
- ...there are other possibilities

Certification programs and citizens-led change

- The experience of a pioneer (Joe Killeen)
- Citizens could provide the incentives needed to foster sustainability of supply chains:
  - A certification program that rates the degree of sustainability of the supply chains serving a establishment will
    - Provide information to citizens about what the companies are doing for sustainability
    - Lead citizens to patronize the businesses doing good
    - Ultimately, provide the incentives needed to foster transformation

Crazy idea? Not quite...

- A study by SRA found that diners are willing to pay more for dining, to foster sustainability
- Big deal? Yes
  - Restaurants in NYC produce more truck trips than the port Retail customers may behave the same way...
- The carrotmob experience (www.carrotmob.org, http://vimeo.com/925729)



Potential impacts of OHD (one of many ideas)

- Implementing off-hour deliveries in NYC leads to:
  - Time savings to all travelers: 3-5 minutes per trip
  - Time savings to carriers in off-hours: 1.5-3.5 hours/tour

% OHD	CO Reduction (metric tons)	HC Reduction (metric tons)	NOx Reduction (metric tons)	PM_{10} Reduction (kilograms)
6.49%	101.196	24.047	3.004	20.29
14.10%	169.582	28.535	8.223	48.81
20.90%	202.749	39.972	11.824	69.99
25.34%	253.141	56.559	15.044	90.09
29.07%	383.813	55.764	26.333	149.86

- Economic benefits between $100-$200 million/year

In conclusion

- Achieving sustainability is all about behavior change
- Technology-only approaches do not always lead to more sustainable outcomes:
  - If technology leads to lower costs, it may induce demand (not what you want)
    - Demand management is needed to ensure a mpore sustainable outcome
    - Not using demand management → Efficiency Paradox
  - If the technology does not lead to lower costs
    - Private sector is less motivates to embrace it technology
    - Other incentives are needed from public sector or citizens Implementation path is more difficult
- Holistic approaches are the key

Thanks!

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Video