Alice in Wonderland and the Cheshire Cat

Which Way Are We Going, and Does it Matter?
Thinking Globally, Acting Locally, and Walking the Talk

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“Would you tell me, please, which way I ought to go from here?”

“That depends a good deal on where you want to get to,” said the Cat.

“I don’t much care where...” said Alice.

“Then it doesn’t matter which way you go,” said the Cat.

– Lewis Carroll, Alice’s Adventures in Wonderland (1865)
Summary

• Problem is very big – John Heywood identified the need for 8 independent pattern breaks, each to get 25% real reduction

• Lemons can sometimes make lemonade

• We need a comprehensive approach that is both directionally correct and of a suitable magnitude

• The Charles River crossing crisis provides MIT a sustainable transportation initiative - an opportunity to walk the talk and advance research and education
Which way are we going?

• Greenhouse gas production and climate change
  – Total US production: 28% transport; 16% auto & truck

• Congestion increasing in all metropolitan areas

• Balance of payments problems
  – Petroleum 66% imported

• Economic shocks as petroleum price spikes; new consumers in Asia

• Unemployment high and persistent
The Danielle principle

- Wisdom from a 5 year-old attempting to eat (too much) spaghetti
What is sustainability?

• Brundtland Commission (1983) sustainability triangle

• Achieve Environmental, Economic, and Equity benefits simultaneously

• Both ethical and pragmatic
“If you don’t measure, you can’t manage”

• But what if you measure the wrong things?
• What if you measure the wrong way?
• Enormous efforts have gone into short-range tools to predict behavior
• Much less effort has gone into long-range prediction, pattern breaks, and the proper evaluation of long range consequences
Environment

- Environmental impacts growing at rates lower than business-as-usual being considered “savings”
  - Political spin and misleading
- Substantial reduction in GHG is required
  - To 1790 levels, not 1990
Equity

- Equitable share of current level of GHG production requires a 90% reduction in the US (from 25 tons per capita per year to 2 tons), 75% globally (from 7-8 tons)
- Our US equitable share is more than used up by current auto and truck alone
- But access to opportunity within sprawling metropolitan areas is difficult to achieve without more VMT
- Many “solutions” raise equity issues
  - Congestion pricing
  - Remote housing locations
  - High transit fares
Economy

- GDP, rest in peace
  - Joseph Stiglitz & Amartya Sen, Nobel Prize winning economists
- GDP net of transport costs
- Hidden part of the iceberg
- Balance of payments
- Need for economic stimulus, and deflationary impact of petroleum imports
- Travel time saving are measurable and can help predict behavior, but are meaningless for evaluation purposes
- Need for accessibility, agglomeration benefits not yet easily measurable
What might we do within transportation?

• The external costs and benefits are huge, making prediction of behavior very disconnected from evaluation of benefits and costs

• Tax, subsidize, and regulate are key elements of policy

• But politics, values, condition options for all three
Formula

\[
\frac{\text{GHG}}{\text{Pollution}} \div \frac{\text{Petroleum}}{\text{VHT}} \times \frac{\text{VHT}}{\text{VMT}} \times \frac{\text{VMT}}{\text{VEH}} \times \frac{\text{VEH}}{\text{POP}} \times \text{POP}
\]

*Population is affected by per capita income*
FIX THE AUTO
Oil shocks of 1970’s

- Instead of
  - Gas rationing with white market
  - Absolute fuel economy standards
- CAFE to get from 15 MPG to 27 MPG by 1987
- But truck exemption
  - Vehicle technology oriented to acceleration and speed
  - Myth of market forces (watch tonight’s 11 o’clock news auto advertisements)
  - Inspection and maintenance not dealt with
The California Car as National Standard

- After 30 years of foot dragging by the auto industry
  - 35 MPG by 2016 now seems assured as fleet average for new cars.
    - Supposedly includes auto company responsibility for inspection and maintenance

- Dwarfed by growth in VMT
  - 1979 → 2008, VMT increases by 91%;
  - 1979 → 2008, CAFE achieved 20.1 → 27.0 MPG
  - If by 2016 CAFE gets to 35 MPG, but VMT increases by 75%, we are worse off

- Clunkers will continue to circulate for another 15 years somewhere on planet earth

- Remember, consumption in 1979 was much too high, that’s why CAFE was developed.

- We only got the California Car because of the decentralized state based efforts under the CAA of leaders like California and Massachusetts
Cash for Clunkers

• Supposed to be a win-win
  – Economic stimulus for the auto industry
  – Environmental gain by reducing pollution and GHG

• Original proposal
  – Replace 15 MPG vehicles with 35 MPG

• Outcome as reported
  – 15 MPG vehicles replaced by 25 MPG
Cash for Clunkers Analyzed

- Analysts complain that CO$_2$ reductions at $400$/ton $>$ $28$/ton
  - “Low hanging fruit” is mostly a concern for fruit thieves
  - Farmers know that there is a lot of work required to plant and care for trees
  - Often the best fruit is on top, where the sun shines strongest
Embedded decisions

- Auto driven 12,000 miles per year for 15-20 years
Fix the system

• Shift towards transit oriented development
Who Decides?

• If analysis is supposed to speak truth to power, who has the power to decide to fix the system
Who decides? **Federal**

**DOT** – National legislation & implementation

- Capital for highways and transit
- Highway costs, user financing is myth
- Transit as a rider on highways
- Highways are popular because they are like peanut butter
- Transit can help highways
- Transit can provide accessibility to suburban youth and elderly
- Feds can get into operations and maintenance

**EPA** – State by state potential initiatives

- CAA; parking limits; O&M
- Federal tax policy
  - Mortgage payment exemptions
  - Pre-tax treatment of employee transit and parking benefits
Who decides? **State & Metro**

- Capital > O&M
  - Expect federal capital
- Transit is lumpy
- Clean Air Act compliance can move behavior in a green direction
Who decides? Municipal

- Roads belong to cities & towns
- Transit belongs to non-existent metropolitan level
Who decides? Major employers

- Access to employees
- Parking costs money
- Synergy & agglomeration benefits
- Employee benefits
Who decides? **Individual**

- Save one car. Use transit
- Use car less. Use transit
- “I wanna be like you, rich man”
  - Advertising and values
- Individual as political actor is capable of action beyond narrow, short-term interest
The HERO of the California Car

OR

The VILLAIN who is dismantling the California transit system
When God gives you lemons, make lemonade, and we have a lot of lemons

- We have a constraint on world petroleum production, and dirtier tar sands will worsen both cost and pollution
- As income rises, so does auto ownership and use
- Congestion is worsening, new highway capacity is much more difficult than in the 1950’s and costs much more
- We can’t afford to maintain our highways
- Rebuilding old highways reduces capacity during construction
- Maintaining traffic during construction costs a lot of money
- The US transit industry is in trouble
- Baumol’s Cost disease (Import substitution, technology change, politically difficult for public agencies)
- Highway cost is the tip of the iceberg
- Transit oriented development requires more public subsidy to build and operate transit
Possible sources of lemonade

• Transit provides local permanent jobs
• London and Zurich seem to have reached a point of increased income accompanied by reduced auto ownership
• Cost of transportation plus housing is a constant
• Housing assets last longer than autos
LAND USE
Economic growth …

…involves rural to urban migration

• But what kind of cities?

Chicago is Manhattan surrounded by Phoenix

• How do we grow more like Manhattan (London, Zurich) and less like Phoenix?

• How does Boston become more like Zurich?
1958 - 1995
Embedded decisions

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<table>
<thead>
<tr>
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<tr>
<td>Highways</td>
<td>50 years</td>
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<tr>
<td>Parking garage</td>
<td>25 years</td>
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<tr>
<td>Parking lot</td>
<td>3 years</td>
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<tr>
<td>Transit (rail)</td>
<td>75 years</td>
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<tr>
<td>Transit (busway)</td>
<td>10-15 years</td>
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## Embedded decisions

<table>
<thead>
<tr>
<th>Type</th>
<th>Duration</th>
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<tbody>
<tr>
<td>A housing units</td>
<td>50 years</td>
</tr>
<tr>
<td>An office tower</td>
<td>25 years</td>
</tr>
<tr>
<td>A shopping center</td>
<td>15 years</td>
</tr>
<tr>
<td>A manufacturing center used to last</td>
<td>75 years</td>
</tr>
<tr>
<td>A hospital</td>
<td>150 years</td>
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<tr>
<td>A university</td>
<td>400 years</td>
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Unique role of universities

<table>
<thead>
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<th>University</th>
<th>Feature</th>
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<tr>
<td>MIT</td>
<td>Charles River crossings</td>
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<tr>
<td>Harvard</td>
<td>Allston campus</td>
</tr>
<tr>
<td>Northeastern, BU</td>
<td>High density campus</td>
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<tr>
<td>BC</td>
<td>Seminary grounds</td>
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- Major employment centers
- Centers of research & education
- Part of life experience of world leaders
Formation of attitude

• High density & open space
• Build high density housing
• Transit, not auto
• Open, permeable campus
Role of students

• Insist that institutions walk the talk
New local lemons

• Every bridge over the Charles from Boston Harbor to Watertown except Mass. Ave needs major reconstruction within the next decade
  – Together they carry more traffic than the Central Artery

• The regional transportation plan relies on transit carrying 50% more people, but includes very little new central system transit capacity

• The regional transportation plan does not dealing with the crumbling Turnpike, but does include the Crosby Corner overpass

• It’s about peanut butter, not cost effectiveness
Possible lemonade

• River crossing mitigation can fund added transit
• Role of universities, hospitals, employers
• New federal surface transportation act expected next year
• New EPA Clean Air Act implementation initiatives are possible on a state-by-state basis
• New federal tax policies are possible
The River Crossing rebuild as an opportunity

- The loss of 20% of capacity for 5-10 years is not a policy debate, it’s a fact
- If we can shift mode away from the auto enough to survive for 5-10 years, why not forever?
- To solve our global, national, and metropolitan problems, we need several “pattern breaks.: could this be one?
Unique opportunity for MIT

• Mens et manus
• Walk the talk
• Behavior as major employer
• Opportunity for research and education
Lemons

• Lack of transit capacity
  – Red & Green lines at capacity
  – Bus system at capacity and trapped in congestion

• Traffic accommodation on bridges had degraded environmental quality of parks, bridges, and approaches

• The auto user pays myth constrains funding for transit
Opportunities

- Understanding and measuring congestion externalities
- Zero marginal cost transit pass
- Parking reductions
- Carpooling initiative
- Improve transit priority on street
- Improved transportation information
- Street design for multimodal use
  - Transit, bicycle, pedestrian, and park amenities
- Real-time operator control
- Shuttle service integration with MBTA
- Re-use rail infrastructure – Grand Junction
- Defining and measuring agglomeration and accessibility benefits
- Identifying and offsetting Baumol’s Cost disease
- Use of cell phone data to monitor behavioral change

Each has potential for research and possible implementation, and monitoring of results
• Wilberforce
• Bury the Chains